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CONTENTS

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For Complete Table of Contents, See Page 1

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Journal of Orthopaedic Surgery, Volume I, 1919
Author's Index—Original Articles

Bennett, G. E. The Lengthening of the Quadriceps Tendon. Preliminary Report 530

Brackett, E. G. Productive Occupational Therapy in the Treatment of Disability of the Extremities 40

Bradford, E. H. Ambulatory Treatment of Fracture of the Neck of the Femur 465

Case Recording in Spinal Curvature 429

Campbell, W. C. Transference of the Fibula as an Adjunct to Free Bone Graft in Tibial Deficiency 625

Chutro, P. Infected Wounds of the Ankle 521

Cone, S. M. Some Practical Applications of Pathology in the War Injuries of Nerves 157

Cotton, F. J. Reconstruction Hospital on Parker Hill 255

Cowan, J. F., and Ely, L. W. A Study of Buried Bone 100

Danforth, M. S. The Diagnosis and Pre-Operative Treatment of Nerve Injuries 562

Donnelly, L. C. Results Obtained by Treating Weak-Feet Along Military Lines Among Civilians 219

Dunn, N. Calcaneo Cavis and Its Treatment 711

Eickenbary, C. F. The Treatment of Chronic Osteomyelitis 115

Elmslie, R. C. The Relationship of Fracture of the Lower Epiphysis of the Tibia to the Arrest of the Growth of Bone 215

Pseudocoxalgia Following Traumatic Dislocation of the Hip in a Boy Aged Four Years 109

Ely, L. W., and Cowan, J. F. A Study of Buried Bone 100

Evans, E. L. Clonic Spasmodic Contractions, Illustrated by a Case of Clonic Spasmodic Contraction of the Muscles Around the Hip Joint 294

Freiberg, A. H. The Bristow Coil and Treatment by Graduated Muscle Contraction 148

Gallie, W. E. Chronic Septic Inflammation in Bone Following Gun-shot Wound 470

Galloway, H. P. H. President's Address: Readjustment to Changing Conditions 395

Geist, E. S. Non-Union Following the Corrective Osteotomy of the Tibia 527

Girdlestone, G. R. A Note on Pott's Disease and Albee's Spinal Graft 401

Hammond, T. E. Non-Operative Treatment of Nerve Lesions Involving the Upper Extremity 320

Harding, M. C. Severe Acute Sprains of the Knee-Joint 152

Hass, S. L. The Changes Produced in Growing Bone After Injury to the Epiphyseal Cartilage Plate 67, 166, 266

Hess, H. L. Metacarpal and Phalangeal Traction Splint 302

Hodge, R. L. A Simple Splint for the Treatment of Fracture of the Clavicle 439

Jones, A. R. Tendon Fixation in Musculo Spiral Paralysis 135

Kidner, F. C. The Treatment of Ununited Fractures 549

363057

Kilmer, T. W. Mensugraph. A Method of Measuring and Plotting Orthopaedic Deformities by Photography 297
Kleinberg, S. Tuberculin 722
Langworthy, M. The Treatment of Joints Stiffened by War Injuries 349
Lewis, F. E. A Splint Devised for the Treatment of Stiff Metacarpo Phalangeal Joints 222
Little, E. M. Two Unusual Complications in Amputation Stumps 457
Specialism and General Surgery. Presidential Address. British Orthopaedic Association 63
McMurray, T. P. Discussion of the Indications, Technique and Results of Transplantation in Gunshot Injuries of Nerves 125
Mayer, Leo. Infected Gunshot Injuries of the Hip 7
Merrill, W. J. Mesial Triprism 434
The Pedal Groups 562
Tarsal Torsion in Weight Bearing 23
Mumford, E. B. The Application of Curative Therapy in the Workshop 676
Metcalf, C. R. Impairment of Function of the Hand Due to War Injuries 198
Nutter, J. A. The Standardization of Joint Records 423
Ogilvy, C. Operation for Permanent Correction of Weak Feet in Children 343
Osgood, R. B. Gunshot Injuries to Joints 304
The Orthopaedic Outlook 1
A Survey of the Orthopaedic Services in U. S. A. General, Base and Debarkation Hospitals 359
Painter, C. F. Fracture Dislocation of Head of Right Humerus, An Unusual Case 468
Internal Derangements of the Knee-Joint 416
Platt, Harry. Treatment of Flail Joints of the Upper Limb Following Gunshot Injuries 667
Roberts, P. W. Osteochondritis of the Hip 493
Sever, J. W. Disability Following Injuries to the Back in Industrial Accidents 657, 743
Steindler, A. Operative Treatment of Paralytic Conditions of the Upper Extremity 608
Tendon Transplantation of the Foot, Report of 48 Cases 187
Stern, W. G. A Report on the Cleveland and Elyria Cripple Surveys 23
Swaim, L. T. Some Interesting Back Cases 249
Swett, P. P. Personal Experience in the Use of Lane Plates 673
Truslow, W. A Self-Correcting Brace for Lateral Curvature of the Spine 547
Verrall, P. J. Stiff Fingers: With Special Reference to Methods of Treatment by Metal and Plaster Splints 335
Wallace, J. O. Diagnosis of Syphilis of Bones and Joints 258
Whitman, R. Loop Operation for Paralytic Deformities of the Foot 459

Journal of Orthopaedic Surgery, Volume I, 1919

*Subject Index

Abduction Method of Treating Fracture of the Neck of the Femur. A Demonstration.—Whitman, R. 393
ABDUCTION TREATMNT OF FRACTURE OF THE NECK OF THE FEMUR,—*Whitman, R.* *248*
AMBULATORY TREATMENT FRACTURE OF NECK OF THE FEMUR,—*Bradford, E. H.*... *465*
AMERICAN EXPEDITIONARY FORCES AND MEDICAL WORK,—*Osgood, R. B.*..... *52*
American Journal of Orthopedic Surgery..... 682
American Orthopedic Association Meeting.....180, 242, 387
Amputation of the Leg, New Procedure in,—Phocas..... 243
Amputation, Open, Through Knee-Joint,—Smith, M. K..... 702
Amputation, Spurlike Formation of Bone Following,—Morgan, J. D..... 390
AMPUTATION STUMPS, COMPLICATIONS OF;—*Little, E. M.*..... *457*
Amputations,—Chisholm 636
Amputations, Cinematic,—Gunn and Gallie..... 637
Amputations of the Foot,—Corlette..... 647
ANKLE, INFECTED WOUNDS OF,—*Chutro, P.*..... *521*
Ankle, An Operation for Stabilizing the Foot and,—In Poliomyelitis,—Peckham, F. E. 61
Ankle-Joint, Fractures of,—Stoner, A. P..... 694
Apparatus, Immediate Application of, In Cases of Amputations of Lower Limbs,—Roederer 244
Appliances, Orthopaedic, Use of, in the Treatment of War Disabilities,—LeMesurier 763
ARM, PARALYSIS OF THE, OPERATIONS FOR,—*Steindler, A.*..... *608*
Arthritis, Deforming, of the Hip—Beaujard, Roussy, Caillods and Cornil..... 451
Arthritis of the Hip-Joint, Tuberculous Diagnosis and Treatment of,—Meyerding 124
Arthritis, Purulent, Treatment of,—Willems..... 504
Arthritis, Suppurative Treatment,—Everidge..... 583
Arthritis, Teeth and Tonsils as Factors in,—Hammond, R..... 57
Arthritis, Tonsillectomy in,—Little and Ryons..... 452
Arthroplasty,—Baer, W. S..... 652
Arthrotomy, Treatment by Wide,—Willems..... 504
Articulorum, Hydrops, Two Cases of Intermittent,—MacClelland, H..... 453

Back-Ache, Common Lesions Producing,—Shackleton, W. F..... 183
BACK CASES, SOME INTERESTING,—*Swain, L. T.*..... *249*
BACK INJURIES,—*Sever, J. W.*.....*657, 743*
Back Injuries,—Wallace 633
Bibliography—
Current Orthopaedic Literature.....685, 755
Bone Affections, Radiographic Differential Diagnosis of,—Hess, J. H..... 770
BONE, BURIED, A STUDY OF,—*Cowan and Ely*..... *100*
Bone Cavities, The Closure of,—Sargent, P..... 446
BONE CHANGES, AFTER INJURY TO EPIPHYSEAL CARTILAGE PLATE,—*Haas S. L.* *67, 166, 266*
Bone, Disease of,—DeGaulejac and Nathan..... 510
Bone Graft and Arthritis. Reconstruction Surgery. Dubose..... 51
Bone Graft for Femur Defects,—Davison..... 644
Bone Graft, Part Played By,—Mamourian, M..... 49
Bone Grafting, Spinal,—Lambert, T. E..... 51

*Articles published originally in this Journal indicated by capitals.

Bone Grafts,—Keith 653
Bone Grafts, Segmentary, in Military Surgery,—Mauclaire 447
Bone, Gunshot Wounds of,—DeGaulejac 507
Bone Regeneration in Bone Graft,—Dupuy DeFrenelle 642
Bone Regeneration in Osteomyelitis,—McCurdy 643
Bone, Sepsis of,—*Gallie W. E.* *470*
Bone, Spur-Like Formation of, Following Amputation,—Morgan, J. D. 390
Bone Transplant from the Tibia to the Lower Jaw,—Powers, C. A. 772
Bone and Joint Lesions of Yaws,—Maul, H. G. 709
Bones, Long, Pseudarthroses of,—Glueke 697
Bones and Joints, Syphilis of. Diagnosis,—Wallace, J. C. 258
Book Reviews—
Fractures, Treatment of, by Suspension,—P. DesFosses and Charles Robert 240
Functional Prosthesis of the War Wounded,—Ducroquet 443
Gunshot Fractures of the Extremities,—Blake 386
Prosthesis of the Lower Limbs,—Martin, F. 383
Skeleton, The Human,—Walter, H. E. 47
Treatise on Orthopedic Surgery,—Whitman, R. 444
Treatment of War Wounds by Method of Menciere—Creignou 315
Bowlegs, Non-Union After Operation for,—*Geist, E. S.* *527*
Brace, Self-Correcting for Lateral Curvature of the Spine,—*Truslow, W.* *547*
Bristow Coil and Treatment by Muscle Contraction,—*Freiberg, A. H.* *148*
British Orthopaedic Association Meeting, Annual 442, 499, 632

Calcaneo Cavus and Its Treatment,—*Dunn, N.* *711*
Casualties of War and Industry and Their Relationship to Orthopedic Surgery,—Freiberg, A. H. 49
Clavicle, Fracture of, Barrel-Stave Splint in,—Royster, H. S. 769
Clavicle, Fractures of, A Simple Splint for the Treatment of,—Hodge, R. L. 439
Cleveland, Ohio, Survey of Cripples in,—McMurtrie 649
Cleveland and Elyria Cripple Surveys, A Report on,—Stern, W. G. 23
Contracture, Dupuytren's,—Gill, A. B. 696
Contracture, Volkmann's Pathological Treatment of,—Rene Dumas 59
Contractures, Clonic Spasmodic,—Evans, E. L. 294
Contractures, Hysterical,—Hurst 500
Contractures, War, Localized Tetanus, Etc.—Hurst 500
Correspondence—
Manuscripts of Medical Officers of the U. S. Army, Regulations for 254
Traction, Stretching, Suspension 47
Cripple Surveys of Cleveland and Elyria, A Report on,—Stern, W. G. 23
Crippled Children. Their Physical and Educational Needs,—Horwitz, A. E... 389
Cripples, Civilian, Editorial 497
Cripples, Survey of,—McMurtrie 649
Crucial Ligaments, Injuries to,—Smith 517
Current Orthopaedic Literature—
..... 49, 119, 181, 243, 316, 389, 446, 500, 573, 633, 691, 760
Curative Therapy in the Work Shop, Application of,—*Mumford, E. B.* *676*
Disability Prevention and Time Saving, Following Industrial Accidents,—Editorial 752
Disabled Soldiers, Independence for,—McMurtrie 646
Dislocation of Hip, Congenital,—Jahss 57

Editorials—
Care of Civilian Cripples 497
Journal of Orthopaedic Surgery, History of 46
Notes on the History of Orthopaedic Surgery 683
Time Saving and Disability Prevention Following Industrial Accidents 752
Education, Vocational, Federal Board for,—Brunson 645
Educational Needs of Crippled Children,—Horwitz, A. E. 389

Epiphysis, A Study of the Development of the,—Kruescher, P. H. 182
Epiphyseal Cartilage Plate, Bone Changes After Injury to the,—*Haas, S. L.* *67, 166, 266*
Equino Valgus, Paralytic, Operation for,—*Whitman* *459*
Extremities, Bone Surgery of,—Thompson 586
Extremities, Conditions Found in,—DeGaulejac and Nathan 510
Extremities, Disabilities of, Productive Occupational Therapy in the Treatment of,—*Brackett, E. G.* *40*
Extremities, Upper, Operative Treatment of Paralytic Conditions of,—*Steindler, A.* *608*
Extremities, Upper Non-Operative Treatment of Nerve Lesions Involving the,—*Hammond, T. E.* *320*

Fat Embolism,—Caldwell and Huber 655
Femur, Central Dislocation of (Intra-Pelvic Displacement) 760
Femur, Defects of, Bone Graft for,—Davison 644
Femur, Fracture, Gunshot,—Buchbinder 589
Femur, Fracture of the Neck of the, Abduction Treatment of,—Whitman, R. 248
Femur, Fracture of the Neck: Treatment by Abduction Method, A Demonstration,—Whitman, R. 392
Femur, Fractures of,—Hardouin 507
Femur, Fractures of,—Hurley and Weedon 508
Femur, Fractures of,—Massie 511
Femur, Fractures of,—Van de Velde 767
Femur, Fractures of, Neck of the,—*Bradford, E. H.* *465*
Femur, Luxation of,—Froelich 511
Feet, Flat, Treatment of,—Burk 520
Feet, Flat and Weak,—Scheimberg, H. 392
Feet, Static Defects of the,—Rich, E. A. 186
Fibula, Transference of, for Tibial Defect,—*Campbell, W. C.* *625*
Fingers, Injuries to,—Hughes, W. K. 389
Fingers, Stiff, With Special Reference to Methods of Treatment by Metal and Plaster Splints,—*Verrall* *335*
Flail Joints After Resection, Treatment of,—Tavernier and Jalifer 592
Flail Joints of the Upper Limb, Following Gunshot Injuries, Treatment of,—*Platt, H.* *667*
Fluid, Synovial, An Artificial,—Morris, R. T. 389
Focal Infection as a Cause of Painful Heel,—Epstein 641
Foot, Amputations of,—Corlette 647
Foot, Disabilities, Mild and the Army Shoe,—Rugh 56
Foot, Flat,—Crandon 520
Foot, Flat, Treatment of,—Burk 520
Foot Muscles (The Pedal Groups)—*Merrill, W. J.* *562*
Foot, Problem, The,—Mebane, T. S. 56
Foot and Ankle, An Operation for Stabilizing,—Peckham 61
Fracture, Clavicle, Barrel-Stave Splint, in,—Royster 769
Fracture, Cervical Vertebra, With Restoration of Bony Substance,—Luckie, L. F. 394
Fracture, Femur,—Bulkley, S. 575
Fracture, Femur, Gunshot,—Buchbinder 589
Fracture, Femur, Neck of,—*Sever, J. W.* *247*
Fracture, Femur, Neck of, Abduction Treatment,—Whitman 248
Fracture, Femur, Neck of, Treatment of by the Abduction Method, A Demonstration,—Whitman, R. 392
Fractures, Clavicle, A Simple Splint for the Treatment of,—*Hodge, R. L.* *439*
Fractures, Complicating the Ankle-Joint,—Stoner 694
Fractures, Compound,—Slessinger 509
Fractures, Compound, Treatment of, by the Use of the Triangle Splint,—Turner, P. 394
Fractures, Femur, Lower Third,—Van de Velde 767

Fractures, Gunshot,—Wilson 691
Fractures, Humerus, Gunshot,—Smith, M. K. 769
Fractures, "No-Splint" Treatment of,—Dowden 507
Fractures, Overlapping, Application of Extension to,—Freeman 696
Fractures, Patellar Border, Recognition and Significance of,—Salmond 456
Fractures, About Shoulder, In Humerus and About Elbow,—Dowden, J. W. 394
Fractures, Spinal Column With and Without Cord Injury,—Sharpe, N. 61
Fractures, Sub-Trochanteric, Reduction of, by Ventral Position,—Constantini and Vigot 456
Fractures, Treatment of, by Suspension and Traction,—Moore, G. A. 54
Fractures, Ununited,—Brackett, E. G. 654
Fractures, Ununited, of the Patellar and of the Olecranum,—Albee, F. H. 455
FRACTURES, UNUNITED, TREATMENT OF,—*Kidner, F. C.* *549*

Hallux Valgus, A New Operation for,—Rugh, J. T. 245
Hallux Valgus, Surgical Treatment of,—Field, J. 699
HAND, IMPAIRMENT OF FUNCTION OF, DUE TO WAR INJURIES,—*Metcalf, C. R.* *198*
Hand, Problems of Reconstruction,—Steindler 55
Hand and Forearm, Orthopaedic Reconstruction Work on,—Steindler, A. 244
Hands and Feet, Practical Method for Making Molds of,—Roederer 317
Heel, Painful, Focal Infection as a Cause of,—Epstein 641
Hemiplegia, Orthopaedic Treatment of,—Taylor, A. S. 708
Hemophilia, Case of, With Effusion Into the Knee-Joints,—Roth, P. B. 59
Hip, Arthritis of the, Deforming, in the Adult,—Beaujard, Roussy, Caillods, and Cornil 451
Hip, Congenital Dislocation of,—Jahss, S. A. 57
Hip, Congenital Dislocation of, Use of Continued Extension by Means of a New Extension Frame in the Bloodless Reduction of,—Churchman, J. W. 450
Hip, Gunshot Wounds of,—Mayer, L. 590
HIP, INFECTED GUNSHOT INJURIES OF THE,—*Mayer, L.* *7*
HIP, OSTEOCHONDRITIS OF THE,—*Roberts, P. W.* *493*
HIP, TRAUMATIC DISLOCATION OF, PSEUDOCOXALGIA FOLLOWING,—*Elmslie, R. C.* *109*
Hip Joint, Diagnosis and Treatment of Tuberculous Arthritis of the,—Meyerding, H. W. 124
Hip-Joint, Tuberculosis of the,—Gauvain, H. J. 183
Historical Note on Orthopaedic Surgery—Editorial 683
Hodgen, Wire Cradle Extension Suspension Splints,—Nifong 50
Humerus, Fracture, Dislocation,—Painter, C. F. 468
Humerus, Fractures of, Treatment by Suspension and Traction,—Smith, M. K. 769
Humerus, Fractures of Upper End,—Stevens 512
Humerus, Pseudarthroses of,—Dujarier, C. 692

JOINT, FLAIL, TREATMENT OF,—*Platt, H.* *667*
JOINT, RECORDS, STANDARDIZATION OF,—*Nutter, J. A.* *423*
Joint, Resection, Flail Joint,—Tavernier and Jalifer 592
Joint Wounds (and Bone), Some Points in the Treatment of,—Teece, L. G. 53
Joints, Gunshot Injuries to,—Osgood, R. B. 304
Joints, Gunshot Wounds, Infections,—Mollenhauer and Mayer 590
Joints, Laceration and Infection of, in Children,—Mitchell 184
JOINTS, (STIFF) METACARPO PHALANGEAL, SPLINT DEVISED FOR TREATING,—*Lewis, F. E.* *222*
Joints, Primary Suture of,—LeFur, R. 709
JOINTS, STIFFENED BY WAR INJURIES, TREATMENT OF,—*Langworthy* *349*
Journal of Orthopaedic Surgery, Editorial 46

Knee-Joint, Arthritis of, With Suppurative Treatment,—Everidge 583
Knee-Joint, Case of Loose Bodies in,—Roth, P. B. 185
Knee-Joint, Derangements of Semi-Lunar Cartilage of,—Henderson, M. S. 453

Knee-Joint, Injury of,—Smith 524
Knee-Joint, Mechanical Derangements of—Henderson, M. S. 391
Knee-Joint, Open Amputation Through the Knee-Joint—Smith 702
Knee-Joint, Sprains, Severe Acute,—Harding, M. C. 152
Knee-Joint, War Injuries, Willems' Treatment,—McWilliams and Hetzel 704
Knee-Joint Wounds, Treatment of,—Pool and Jopson 702
Knee-Joints, Case of Hemophilia, with Effusion Into the,—Roth, P. B. 59
KNEE-JOINTS, INTERNAL DERANGEMENTS OF,—*Painter, C. F.* *416*
Kobler's Disease,—O'Brien 508

LANE PLATES, USE OF, PERSONAL EXPERIENCE IN THE,—*Swett, P. P.* *673*
Leg, Amputation of, New Procedure in,—Phocas 243
LEG, BONE SURGERY OF,—*Campbell, W. C.* *625*
Limbs, Functional Disability of,—Morton 516
Limbs, Lower, Amputation of: Immediate Application of Apparatus in Cases of,—Roederer 244
Limbs, Upper,—Slessinger 509
LOOP OPERATION FOR PARALYTIC DEFORMITIES OF THE FOOT,—*Whitman, R.* *549*
Lumbosacral Region, Pain in,—Richards, A. J. 768
Luxations and Dislocations, Congenital,—Jahss, S. A. 57

Mechano-Therapy,—Scal 642
Mechano-Therapy, Some Errors and Prejudices Concerning,—Sandoz 449
MENSUGRAPH: A METHOD OF MEASURING AND PLOTTING ORTHOPEDIC DEFORMITIES BY PHOTOGRAPHY,—*Kilmer, T. W.* *297*
MESIAL TRIPRISM,—*Merrill, W. J.* *434*
METACARPAL AND PHALANGEAL TRACTION SPLINT,—*Hess, H. L.* *302*
Mobilization, Active,—Willems 511
Myositis, Ossificans, Progressiva, A Contribution to the Study of,—Rosenstern, J. 318

Nerve Defects, Bridging of,—Stookey, A. M. 695
NERVE INJURIES, DIAGNOSIS AND PRE-OPERATIVE TREATMENT OF,—*Danforth, M. S.* *563*
Nerve Injuries, Peripheral, Investigation of 1,000 Cases of,—Burrow, J. L., Carter, H. S. 245
Nerve Injuries, Peripheral, Mechanical Treatment of,—Stookey, B. 246
Nerve Injuries, Peripheral, Surgical Consideration of,—Stookey, B. 123
Nerve Surgery,—Adson 655
Nerve Suture,—Blencke 514
Nerve Transplantation, Autoplastic, In the Repair of Gunshot Injuries,—Mayer, Leo 181
Nerves, Peripheral,—Blencke 514
NERVES, TRANSPLANTATION IN GUNSHOT INJURIES OF, INDICATIONS, TECHNIQUE AND RESULTS OF,—*McMurray, T. P.* *125*
NERVES, WAR INJURIES OF, SOME PRACTICAL APPLICATIONS OF PATHOLOGY IN THE,—*Cone, S. M.* *157*
NON-UNION AFTER OSTEOTOMY,—*Geist* *527*
No-Splint Treatment of Fractures About Shoulder, in Humerus and About Elbow,—Dowden, J. W. 394

Olecranon, Ununited Fracture of,—Albee, F. H. 455
Operation, Position of, in the Excision of Cartilage in Military Surgery,—Hammond, T. E. 316
Operations, Tendon,—Mayer, L. 50
Orthopaedic Appliances, Use of, in the Treatment of War Disabilities,—LeMesurier, A. L. B. 763
Orthopedic Events, Current 684, 753
Orthopedic Literature, Current, Abstracts of—
..... 49, 119, 180, 243, 316, 389, 446, 500, 573, 633, 691, 760
Orthopedic Literature, Current, Bibliography of 685, 755

Orthopaedic Outlook, The,—Osgood, R. B. 1
Orthopaedic Services of the U. S. A. General, Base and Debarkation Hospitals, A Survey of,—*Osgood, R. B.* *359*
Orthopaedic Surgery, Historical Note on, Editorial 683
Orthopaedic Surgery, Progress of, Collective Abstract 652
Orthopaedic Surgery, Surgical Technique in,—Elmer, W. H. 243
Orthopaedic Surgery and Casualties of War and Industry,—Freiberg, A. H. 49
Osteitis Deformans. A Report of Two Cases,—Leahy 186
Osteochondritis of the Hip,—*Roberts, P. W.* *493*
Osteomyelitis,—Baetjer 573
Osteomyelitis, Bone Regeneration in,—McCurdy 643
Osteomyelitis, Chronic, Treatment of,—*Eickenbary, C. F.* *115*
Osteomyelitis, in Children,—Wood, A. C. 390
Osteoplastic Surgery During the War,—Charbonnel 448
Osteotomy, Non-Union After,—*Geist, E. S.* *527*

Paralysis of the Arm, Surgery of,—*Steindler, A.* *608*
Paralysis, Cerebral Spastic,—Blahd and Stern 185
Paralysis, Grave, in Gunshot Wounds of the Spine, Operative Treatment of,—Neuhof, H. 390
Paralysis, Spastic, in Children,—Grossman, J. 700
Paralytic Genu-Recurvatum, Operation for the Correction and Prevention of,—Campbell, W. C. 60
Patella, Ununited Fracture of,—Albee, F. H. 455
Pedal Groups,—*Merrill, W. J.* *562*
Pelvic, Displacement, Intra 760
Pelvic Erruption,—Froelich 518
Personal Mention 684, 753
Perthes Disease,—Watkins, W. W. 453
Philadelphia Orthopaedic Club Meeting 754
Posture, Good,—Rogers, J. F. 392
Pott's Disease, Surgical Treatment of,—McIlhenny, P. A. 390
Pott's Disease and Albee's Spinal Graft, A Note on,—*Girdlestone, G. R.* *401*
Prize, Samuel D. Gross 754
Pseudarthroses of the Humerus,—Dujarier, C. 692
Pseudarthroses of the Long Bones,—Glueke 697
Pseudocoxalgia Following Traumatic Dislocation of the Hip,—*Elmslie, R. C.* *109*
Public Provision,—McMurtrie 520
Putti Method in Amputations,—Gunn and Gallie 637

Quadriceps Tendon, Lengthening of,—*Bennett, G. E.* *530*

Radio-Ulnar Synostosis,—Sever, J. W. 651
Readjustment to Changing Conditions: Presidential Address—*Galloway, H. P. H.* *395*
Reconstruction, Disabled Soldier,—Billings 639
Reconstruction Hospital on Parker Hill,—*Cotton, F. J.* *255*
Reconstruction, Physical, and Orthopaedic Surgery,—Goldthwait 699
Reconstruction Surgery with Reference to Bone Graft and Arthritis,—F. G. Dubose 51
Reconstructive Surgery. A Problem of Records,—Nutter 245
Rehabilitation of Disabled in Italy,—Putti, V. 701
Retractor, Self-Retaining for Use with Albee Bone Outfit,—Lowman and Pratt 182
Rickets, Cause of, Observation on the,—Paton, Findlay, and Watson 392

Scaphoid, Disease of,—McClure, C. R. 58
Scaphoid, Tarsal,—O'Brien 508
Scapula, Congenital Elevation of the,—Peckham, F. E. 654
Scars, Surgery of,—Walther 656

Shoulder, Fractures of,—Dowden 507
Shoulder, Stiff and Painful,—Brown, A. J. 762
Society Meetings—
American Orthopedic Association 180, 242, 387
British Orthopaedic Association 442, 499, 632
New York Academy of Medicine, Section on Orthopaedic Surgery 180, 315
Philadelphia Orthopaedic Club 754
Soldier, Disabled,—McMurtrie 513
Soldiers, Disabled,—Billings 639
Spinal Bone Grafting,—Lambert, T. E. 51
Spinal Column, Fracture, With and Without Cord Injury,—Sharp, N. 61
SPINAL CURVATURE, CASE RECORDING IN,—*Bradford, E. H.* 429
Spin, Cervical Injuries of,—Ransohoff, J. 246
Spine, Curvature of,—Bradford, E. H. 587
SPINE, CURVATURE OF, BRACE FOR,—*Truslow, W.* *547*
Spine, Operative Treatment of Gunshot Wounds of, With Grave Paralysis,—Neuhof, H. 390
Spine, Typhoid,—Osler, Sir Wm. 184
Splint Devised for Treatment of Metacarpo-phalangeal Joints,—Lewis 222
Splint, Triangle, Use of, in the Treatment of Compound Fractures of the Humerus,—Turner, P. 394
Splints, Metal and Plaster, in the Treatment of Stiff Fingers,—Verrall, P. J. 335
Splints, Transport of the American Army,—Osgood, R. B. 50
Splints, for Transportation,—Emerson, K. 52
Spondylitis, Post-Traumatic,—Cluzet 454
Surgery, Front, Growth of,—Bowlby, Sir A. 693
Surgery, Front Hospitals,—Pool, Lee and Dineen 122
SURGERY, GENERAL, SPECIALISM AND,—*Little, E. M.* *63*
Surgery, Influence of the War Upon,—Blake 576
Surgical Anatomy, Bones of Extremities,—Thompson 586
Suspension and Traction Treatment of Fractures,—Moore, G. A. 54
Synostosis, Radio-Ulnar, Congenital,—Sever, J. W. 651
Synostosis, Radio-Ulnar, Congenital, Case of,—Kopelowitz 391
Synovial Fluid, Artificial,—Morris, R. T. 389

TARSAL TORSION IN WEIGHT BEARING,—*Merrill, W. J.* *33*
TENDON FIXATION IN MUSCULO SPIRAL PARALYSIS,—*Jones, A. R.* *135*
Tendon Transference Technique,—Bernstein 591
TENDON TRANSPLANTATION OF THE FOOT,—*Steindler, A.* *187*
Tendons, Anatomy and Physiology of,—Mayer, Leo 50
Tetanus, Localized,—Hurst 500
Thomas Splint, Modified,—Hardouin 507
Thumb, New Operation for Substitution of the,—Joyce, J. L. 181
Thumb, Plasty, Late Results of,—Shepelmann, E. 760
Tibia, Bone Transplant from, to the Lower Jaw,—Powers, C. A. 772
Tibia, Lower Epiphysis of, Relationship of Fracture of, to the Arrest of Growth of Bone,—Elmslie, R. C. 215
Time Saving and Disability Prevention Following Industrial Accidents, Editorial 752
Tonsillectomy in Myositis and Arthritis,—Little and Ryons 452
Tributes—
Davis, Gwilym G.,—Rugh, J. T. 570
Wilson, H. Augustus,—Lovett, R. W. 569
TUBERCULIN, ITS USE IN TREATMENT OF TUBERCULAR BONES AND JOINTS,—*Kleinberg, S.* *722*
Tuberculosis of the Hip-Joint,—Gauvain 183
Tuberculosis, Vertebral, Treatment of, by Fusion Operation,—Hibbs, R. A. 57

Vertebra, Cervical, Fracture of, With Restoration of Bony Substance,—Luckie, L. F. 394
Vertebra, Fifth Lambar, Associated with Lumbosacral Pain,—Richards 768
Vocational Education, Federal Board for,—Brunson 645

Weak Feet in Children, Operation for Permanent Correction of,—*Ogilvy, C.* *343*
Weak Feet, Results Obtained by Treating, Along Military Lines,—*Donnelly, L. C.* *219*
Workshop, Curative Therapy, Application in,—*Mumford, E. B.* *676*
Wounds, Infected,—*Chutro, P.* *521*
Wrist, War Surgery of,—Combier and Murard 119

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TABLE OF CONTENTS

THE ORTHOPÆDIC OUTLOOK. *By Robert B. Osgood, Lieut.-Col., M.C.* 1

INFECTED GUN-SHOT INJURIES OF THE HIP. *By Leo Mayer, A.M., M.D.,* New York. 7

A REPORT ON THE CLEVELAND AND ELYRIA CRIPPLE SURVEYS. *By Walter G. Stern, M.D.,* Cleveland, Ohio. 23

TARSAL TORSION IN WEIGHT BEARING. *By William Jackson Merrill, M.D.,* Philadelphia, Pa. 33

PRODUCTIVE OCCUPATIONAL THERAPY IN THE TREATMENT OF THE DISABILITIES OF THE EXTREMITIES. *By E. G. Brackett, Colonel, M.C.* 40

EDITORIAL: THE JOURNAL OF ORTHOPÆDIC SURGERY. 46

CORRESPONDENCE. 47

BOOK REVIEW. 47

CURRENT ORTHOPÆDIC LITERATURE. 49

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The Journal of Orthopædic Surgery

THE ORTHOPÆDIC OUTLOOK.

BY ROBERT B. OSGOOD, LIEUT.-COL., M.C.

To obtain a physical outlook we must seek some "Peak in Darien." If we are in the woods we must ascertain in some way whether we may pass beyond the woods by proceeding in a certain direction or whether those woods stretch too far for us to be able to escape with our present store of strength.

If they are too extensive we may be obliged to cut down trees and make a clearing and work out our own salavation as pioneers. We must eventually build roads to the settlements and establish contact relations. The continuance of these contacts must be based on reciprocal demands. To obtain a mental outlook is more difficult. The only picture which can be free from distortion is that composite which is derived from the mirror of our own honest estimation, and the image of ourselves as others see us.

The physical outlook varies with our position; the mental outlook, with our attitude. What is our position at present with the other branches of the medical profession and what is our attitude toward them?

If we can properly discover our position and determine what our attitude is and is to be, we may venture to prophesy, and this prophecy is the outlook as it appears to us.

What is our position at present with relation to the other branches of the medical profession?

Are we in contact with them or are we really isolated? In many places we are in closest contact and the rates of exchange are fair. In

other regions, far too numerous, we represent still more or less isolated groups, sometimes finding existence in the woods precarious, and unable to build roads to the settlements.

We have been a small specialty. Our early masters were pioneers and it was long before their contacts were established. The profession of medicine is still a mystery and an art. It would be well if the mystery were cleared, but we shall not see the art made science in our day. In the early days, and in what we may, at present, call pioneer medical communities, orthopædic surgeons were, and are, looked upon with askance. There is a reason for this and, to some extent, a just reason. It is because an artist abhors a mechanician. The early orthopædic surgeons were brace makers and we, their descendants, are brace makers still.

A man may be respected if he is a surgeon first and a brace maker afterwards, if he is a surgeon by ability and intent and a brace maker by necessity. He will not be respected if he is a brace maker first and a surgeon afterwards, nor will he be respected if he is a surgeon only by necessity. From the barber surgeon developed the Royal College, but not because they became better barbers as the years went on.

We are quite clear in our own mind concerning the soundness of the underlying orthopædic principle. We like to derive the polyglot work from ὀρθός and παιδεύω, to educate straight. A specialty of function and not of anatomy. Perhaps it is too broad, too inclusive. Does not all medicine and surgery attempt to make straight? What right has a small body of men to claim it as their special task? The only right is because few general surgeons and few internists have considered it their task. The derelict no one wanted.

When the wound made by nature or by art was healed, too often the task has been considered done. The foot fixed in equino valgus after a Pott's fracture, the flexed knees of an arthritis whose fire has long died out, these are bad surgical and medical results which have excused the existence of the orthopædic surgeon and given him his daily bread.

Of late years they have helped to give him his hospital and teaching positions also, for while tuberculosis and poliomyelitis and rickets and the other chronic bone and joint diseases are still his dole, the lay public are discovering what the rank and file of the medical profession have failed to appreciate, that lesions of the joint mechanism of the body, bones, muscles, nerves must be treated by physiological quite as much as by anatomical methods and that the end result must

be judged by the amount of useful function and not by the beauty of the scar.

This conception which was gradually taking shape, has become much more definite since 1914. Cases began to stream back from the war to home hospitals in France and England whose wounds were healed, whose fractures were united, whose joint sepsis was over, but whose contracted muscles and badly aligned bones and joint deformities represented crippling problems demanding longer and more special treatment than the original lesions.

These were deformities which could be accounted for, which could be excused, for which no one surgeon was to blame, but they were not essential deformities and half of them might have been prevented.

The stream continues to flow, though the preventable deformities are lessening and we believe this is because a more perfect radial control is being worked out in our own army and in the armies of our allies, which control jealously guards function and directs treatment for its conservation from the trenches to the home hospitals.

And, now, having tried to honestly estimate ourselves, let us criticise ourselves as severely as we can. It is true that many orthopædic surgeons have the respect and confidence of many general surgeons, but the specialty as a whole, has not. There must be a reason for this, for the attitude of the general surgeon cannot be engendered by jealousy, the specialty has been too small for that, and the general surgeons are, as a class, too fair. The lack of confidence has been caused by the general impression which exists in the profession that orthopædic surgeons are surgeons only in name. The feeling approaches a benign contempt. As long as we stay as a class, basically mechanicians, we shall deserve this contempt and not deserve its benignity.

It is probably true that no living surgeon combines in his technique such perfect asepsis and such absence of faddism, such manual dexterity and such anatomical knowledge, such power of diagnosis and such ability to obtain functionally good end-results as Sir Robert Jones. We claim him as an orthopædic surgeon. He wishes to be so claimed, but as yet he is only the ideal and not the type. He was a general surgeon of wide practice and unusual success long before he determined to devote his life to the functional surgery of the extremities and the spine. He is an orthopædic surgeon not because he cannot be a general surgeon, but because the cripple appeals to his great heart as it did to his uncle, Hugh Owen Thomas, before him.

Most orthopædic surgeons can cut the tendo Achillis successfully.

A smaller number can remove a torn semilunar cartilage without danger of infection and without damage to the function of the knee joint: but few can do well either a difficult bone graft or excise a hip joint.

The complicated fresh joint fracture, especially if it be compound, is usually safer still as an emergency in the hands of the eminent general surgeon than the eminent orthopædic surgeon. Later, after the acute surgery is done, the orthopædic surgeon may be more surely trusted to think of the end result in terms of function, and this is the consideration which chiefly concerns the patient; but ought we to be obliged to divide authority?

There is no excuse for the failure to acquire good surgical technique if any surgery whatever is to be done. An orthopædic surgeon may say he does not believe in too much operating, meaning thereby that he thinks too much operating is being done. This does not excuse him. Difficult as it may be for this man to keep his "hand in," he had much better keep both his hands out and turn his operative work to another.

Surgical judgment is a real thing. It is born in few men and is usually acquired only by experience. Unless new lines of endeavor are drawn and new avenues of opportunity are opened, this judgment must be gained by experience in general surgery before orthopædic surgery is adopted as a specialty.

We have far too small a proportion of operating surgeons whose judgment is good, whose anatomical knowledge is accurate, and whose aseptic technique is faultless.

We must have a larger proportion if we are to talk about conserving function and have our peers as well as our patients listen.

And now what is the orthopædic outlook?

We believe we have something to give, and we believe that general surgeons have something to take. We must progress beyond the ultimate wish of the German surgeon, "I pray that they do not die on my hands," and cherishing the dictum of Ambrose Paré that the first duty of the surgeon is to do no harm, we must contend that his last duty is to give back to the patient his fullest degree of function.

This emphasis on function is peculiarly a contribution of the orthopædic surgeon and a contribution which should be accepted by the general surgeon.

The war has suddenly brought into prominence a small specialty. It is fair to say that many honest surgeons believe into too great prominence. Will it remain a specialty? Probably yes. We believe that

the final judgment will be that the specialty has rendered a great service to the soldier and to the nation by insisting that locomotive, wage-earning function, conserved and increased, is the chief end of life-saving surgery. It has maintained that a small group of surgeons were specially fitted to direct this conservation and repair. We believe it was right to do so. It was not being done without them; it is being done with them.

It may very well be that old boundary lines will change as they have changed in Europe. It may well be that kindred aims will draw together groups who have been so widely separated as certain peoples now forming nations. Those who have lived together geographically, but not sympathetically, may separate.

And if the dominant air of the specialty was too shrill at first and harsh to many ears, it may yet be merged into a theme and add a motif to a symphony.

The French have found the need of it, and have trained special men for it, but they have not called it orthopædic surgery. The Italians and English have demanded it and used the old name, but a new Italian journal appears, called the Journal of Surgery, having to do with the function of the structures of the extremities, and Sir Robert Jones has accepted the term of Special Surgical Hospitals in place of the designation of Orthopædic Centres, though the character and control of the work have not changed. They have become still more firmly established and recognized.

The name is nothing, the principle is everything, and the principle has been demonstrated to be valid and enormously important in war surgery.

The war is over and war surgery will finally disappear. Shall we swing back to rest on our braces or can we apply the principle more widely than we have done to the lesions of civil life?

There is a field in which are produced crops of injuries which differ only in degree and not in kind, from war injuries. The principles which should govern the treatment of these lesions are exactly those which have been found necessary for the national welfare in the war wounds of the extremities and spine.

The field is Industrial Surgery. It is recognizing itself along with industrial medicine and the importance of the functional results are being realized by state industrial accident insurance boards. Already one State commission has associated itself with a State medical school. The medical school has taken a hospital which it has staffed with or-

thopædic and general surgeons, who do not lose sight of functional end-results.

Curative workshops are being installed and lessened insurance pay ments, fewer idle days, decreased doctors' fees, may be as confidently expected from this attack on the potentially crippling injuries of peace as on those of war.

We believe that industrial surgery opens a wide door to orthopædic principle and practice.

The outlook is alluring because the vision of opportunity is clear and wide and varied.

Our contacts, however, must be closer if we are to seize our opportunity. We must still teach human mechanics and even braces. We must teach the conservation of function in chronic bone and joint disease and in paralytic conditions, but we must learn, also, and then help teach how to apply these principles to the traumatic lesions of adults in which chronicity and loss of function are threatened.

We must measure up to surgical standards of general surgeons. Whether we wander into new country and make new friends does not matter. We may even change our designation and run no risk of losing our identity.

In a letter to an eminent general surgeon, Sir Robert Jones has said, "Our desire is to attract them to the work so as to furnish the best possible treatment to soldiers and civilians and to incorporate these principles of treatment into the education of the general surgeon."

We can ask for nothing better for the specialty than the fate of Tennyson's seed.

"Once in a golden hour I cast to earth a seed;
Up there came a flower; the people said a weed.
To and fro they went, through my garden bower,
And murmuring discontent cursed me and my flower.

"Then so tall it grew it wore a crown of light,
But thieves from o'er the wall stole the seed by night;
Sowed it far and wide, by every town and tower,
Till all the people cried, 'Splendid is the flower!'

"Read my little fable, he who runs may read,
Most can raise the flowers now, for all have got the seed,
And some are pretty enough and some are poor, indeed.
And once again the people call it but a weed."

INFECTED GUN-SHOT INJURIES OF THE HIP.

BY LEO MAYER, A.M., M.D., NEW YORK.

In the October number of the AMERICAN JOURNAL OF ORTHOPEDIC SURGERY has appeared an unusually helpful report by Lieut.-Col. Osgood on the treatment of septic joints.

Two important questions are discussed:

First, whether a stiff joint is better than one in which slight motion, imperfectly controlled, is present;

Second, the question of the advisability of excision.

As a discussion of these questions is best brought to a focus by concentrating on individual instances, and as I have had occasion to treat in rapid succession five cases of septic arthritis of the hip, resulting from gun-shot injuries, it will, I think, be of value to report these cases in the order of their occurrence. From the individual data, thus presented, it will be possible to gain a picture of the pathology of the lesion and a concept of its treatment.

CASE REPORTS

CASE 1. T. M. Born September 19, 1877, was wounded November 18, 1914, by a large shell splinter which struck the inner aspect of the right thigh just below the hip and emerged on the posterior aspect. Examination in the Base Hospital two weeks after the injury showed the following: Wound of entrance 2½ cm. in diameter on the inner aspect of the right thigh 10 cm. below Poupart's ligament. Wound of exit in the gluteal region 8 cm. long, 5 cm. wide. A hand's breadth below the wound of exit, an incision 2 cm. long and 4 cm. wide connected with the wound of exit by a drainage tube. Retention of pus in all the wounds. Shattered bone palpable near the ramus of the ischium. Patient looked septic The temperature ranged from 101 to 102½°. Every movement of the leg was painful but there was no sensitiveness over the head of the femur. In the roentgenogram (see Fig. 1) the ramus of the ischium was seen to be shattered. There was no evidence of involvement of the hip joint.

FIG. 1.—Diagram illustrating the x-ray findings in Case 1 at time of admission.

December 5th, two days after admission, the wound of entrance was enlarged by an 8 cm. incision which was deepened through the adductors down to the ischium. Many necrotic bone splinters and bits of clothing were removed. The highly offensive odor was that characteristically found in the osteomyelitis subsequent to shell injuries.

Through a second incision on the posterior aspect of the thigh on the inner side of the sciatic nerve, the wound of exit was enlarged. A thick drainage tube was run from one wound to the other, and the ischium lightly packed. During the operation no evidence was found of injury to the hip. Despite the free drainage, temperature did not subside. The persistence of the characteristic odor suggested the probability of a progressive osteomyelitis of the ischium. Several days later, there was sensitiveness on the dorsal surface of the thigh external to the wound of exit, and from this wound it was possible to probe a pus pocket which extended upward in the region of the capsule of the hip. December 14th, nine days after the first operation, this pocket was opened by an incision on the outer side of the sciatic nerve, and drained. The temperature fell and for the next three days the patient seemed better. On the fourth day, however, the temperature again rose, although the wounds showed no retention of pus. It was impossible for the patient to locate the pain; nor was there, as yet, tenderness directly over the joint. Gradually a diffuse swelling of the thigh beneath the tensor fasciae femoris suggested the formation of another abscess. By the 30th of December this had become sufficiently definite to justify incision. Operation revealed a pocket extending from the posterior wound forward and downward beneath the tensor fascia and the vastus externus, half way to the knee. The abscess was opened its entire length, and lightly packed. Despite these three incisions and the ample drainage of all superficial pus pockets, the temperature chart persisted in showing an evening rise to 103°. The haemoglobin diminished to 45 and the patient continued to look extremely septic. On the 5th of January, for the first time, there was definite tenderness over the head of the femur. This fact, combined with a very slight swelling in the region of the joint, made the diagnosis of a purulent coxitis highly probable. Two possible courses seemed open; either to dis-articulate at the hip or to excise the joint. Simple drainage did not seem a logical procedure, because of the strong probability of an ascending infection of the bone. Both excision and amputation were bound to be coupled with shock, and the patient was too weak to stand much. Of the two procedures, the excision seemed to me the less dangerous. Therefore, after a preliminary blood transfusion, by which the haemoglobin was raised to 65, the hip was opened by a posterior excision corresponding roughly to the typical Langenbeck. The muscles inserting into the trochanter were cut away from their insertion and deflected upward, thus allowing ample exposure of the joint. The head of the bone was found bare of cartilage, the neck and great trochanter were eroded, the ligamentum teres was entirely necrotic, and the cartilage of the acetabulum looked worm-

eaten. There were a few drops of foul-smelling pus with the joint. The head of the femur, the neck and the entire trochanter were removed by sawing through the femur, just above the trochanter minor (see Fig. 2). It was now possible to examine the asetabulum more carefully. Pressure against the bone caused a little pus to ooze out and the removal of the superficial cortex revealed a generalized osteomyelitis. This extended over the entire area corresponding to the acetabulum, upward over the flare of the ilium to the origin of the gluteus minimus, downward along the descending ramus of the pubis to the point where the bone had been injured by the projectile and backward to the tuberosity of the ischium. This entire area of bone was removed with a large gouge (see Fig. 2). Particular care was paid to maintaining

FIG. 2.—The shaded area illustrates the extent of resection in Case 1.

the integrity of the periosteum on the deep surface of the bone. There was practically no haemorrhage during the operation, which lasted only 23 minutes. The pulse remained excellent throughout, and no shock developed subsequently. The thigh was abducted about 20 degrees, and 10 pounds traction was applied to the limb by adhesive plaster strapping. The patient's condition improved from day to day; the temperature fell gradually. At the end of two weeks it was normal. Four and six weeks later, there were slight rises of temperature owing to the formation of small abscesses, both of which were readily drained without general anesthesia. February 15, 1915, 38 days after the operation, the roentgenogram showed a restitution of the acetabulum and of the ischium. The shaft of the femur had rounded itself off and pointed in the direction of the acetabulum. Three months after

the operation all the wounds were healed and the patient was out of bed on crutches. The shortening of 6 cm. was equalized by raising the shoe, and the patient was soon able to walk with the aid of a cane. At the time of his discharge, he could flex the hip 90 degrees; abduct it 30° and walk three quarters of an hour without tiring. The gait was good with only a slight limp. One and a half years subsequently, I received word from him that he was at his old trade of upholsterer, and that he was able to climb a ladder as in the days before the injury.

Summary: This case is one of complete recovery subsequent to extensive purulent coxitis, developing secondarily to an injury to the ramus of the ischium. A satisfactory range of voluntary motion resulted subsequently to the operation. The shortening of 6 cm. could probably have been prevented, had the operation been performed before the great trochanter became involved. There is no question whatever, that the excision of the joint saved the life of the patient.

Case 2: Lieutenant H. Z., wounded June 14, 1915, reached my hands twelve days later. Despite the plaster spica which fixed the limb in the abducted position, he complained of severe pain in the left hip and in the left foot. Patient looked septic. The temperature ranged between 101 and 102½°. On the outer aspect of the plaster, a window had been cut, exposing a wound 20 cm. long. The edges were oedematous and unhealthy. When the plaster was removed, a healed wound of entrance was discovered in the left groin. Pressure over the head of femur caused intense pain and the discharge of several drops of pus through the wound of entrance. This was at once opened under local anesthesia, and a rubber drainage tube drawn through it and out of the wound of exit. The roentgenogram, (Fig. 3), showed that the

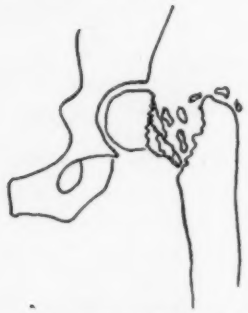

Fig. 3.—Diagram illustrating the x-ray findings in Case 2 at the time of admission.

head was lying free in the acetabulum. The neck of the femur was absent. Between the head and the trochanter lay a mass of fine bone splinters, evidently the remnants of the neck, which had been struck by the projectile. In the neighborhood of the great trochanter several other bone splinters were visible, the outlines of the trochanter were irregular and the shadow of the bone lacked the normal density.

Although the diagnosis of a purulent coxitis seemed certain, the operation was postponed four days, so as to give the nineteen-year-old patient a chance to recover from the effects of the long and wearing transportation from the front. The incision in this instance could not be made as in the first case, since it was advisable to expose the entire track of the bullet, so as to remove all the vestiges of clothes and other sources of re-infection. First an anterior incision was made on the outer side of the anterior crural nerve from the wound of entrance downward. The muscles were separated by blunt dissection, until it was possible to feel the fragments of the femoral neck. The wound of exit was then enlarged and, with a hand in each wound, it was possible to lift the entire muscular mass away from the shattered bone. The two longitudinal incisions were then joined by a transverse running directly below the anterior superior spine and the entire muscular mass deflected downward. In this way, the track of the bullet was exposed from one end to the other, and it was possible to remove numerous bits of clothing, which palpation had not revealed. The head itself was held in place only by necrotic shreds of the ligamentum teres, and was removed without the least difficulty. The acetabulum contained several centimeters of purulent fluid; abscesses were not present; the cartilage of the acetabulum showed no microscopic erosions. The great trochanter, however, showed purulent osteomyelitis and was removed with a saw-cut 1.5 cm. below its tip (see Figs. 4 and 5). The wound was lightly packed with gauze. Packings were brought out through

FIG. 4.—The shaded area indicates the extent of the resection in Case 2.

FIG. 5.—The necrotic head, neck and tip of trochanter removed in Case 2.

the anterior and posterior incisions. The muscle flap was drawn upward and fastened in place by five strong through-and-through sutures. Time of operation 45 minutes. Examination of the head revealed extensive degeneration of the cartilage, which in several places was lifted away from the bone. Sagittal section of the head showed that the infection extended from the cartilage downward into the bone. At the site where the femoral neck had been shattered, the bone was covered with a purulent membrane and from this place also a focus of bony infection could be traced extending 1½ cm. towards the head. The moderate shock, subsequent to the operation, was overcome by cardiac stimulation, combined with 500 c.c. of saline solution given intravenously. The temperature fell gradually. A week after the operation, the evening excursions were not over 100.4. As in the preceding case, a plaster of Paris dressing was not applied. The leg was abducted 15 degrees and held there with a traction of ten pounds. The convalescence was uneventful, except for a purulent arthritis of the left ankle joint. This was opened under local anesthesia and drained through two 1 cm. lateral incisions. Two and a half months subsequent to the operation, the roentgenogram showed a rounding of the upper end of the femur and the formation of a rudimentary head; there was no upward displacement of the femur whatever. The patient was discharged in December, six months subsequent to the injury. At this time he was able to walk a short distance without a stick. He could flex the thigh to a right angle and abduct it 40°. Total shortening was 2½ cm. (see Fig. 6). One year later the shortening had not increased. The patient was able to walk four hours without fatigue; he had climbed several mountains and was in active service in the Aviation Corps.

Summary: The significant facts in this case were (1) the prevention of para-articular abscesses by prompt surgical intervention, (2) the excellent functional result after extensive resection including 1½ cm. of the great trochanter, (3) the occurrence of a metastatic purulent arthritis of the ankle joint, as an indication of the pyaemia likely to be associated with infected gun-shot injuries of the hip.

Case 3: K. R., wounded September 23, 1915, by infantry projectile, reached the Base Hospital seventeen days after the injury. Wound of entrance, 2 cm. above Poupart's ligament (right) and slightly to the outer side of the great vessels; wound of exit on the right buttock; each wound about the size of a 25-cent piece. There was no pus retention, but the dressings showed the discharge of a serous fluid. The thigh was held flexed 90°, and the slightest attempt to straighten it produced marked pain in the hip joint. Rotation of even 1 or 2° was painful and there was marked tenderness to pressure over the head of the femur. It was clear, even without roentgen examination, that there had been an injury to the hip joint. The roentgenograms showed that the neck of the femur had been hit by the projectile. The head was lying free in the acetabulum, and was twisted slightly so as to point downward (see Fig. 7). The temperature never exceeded 101;

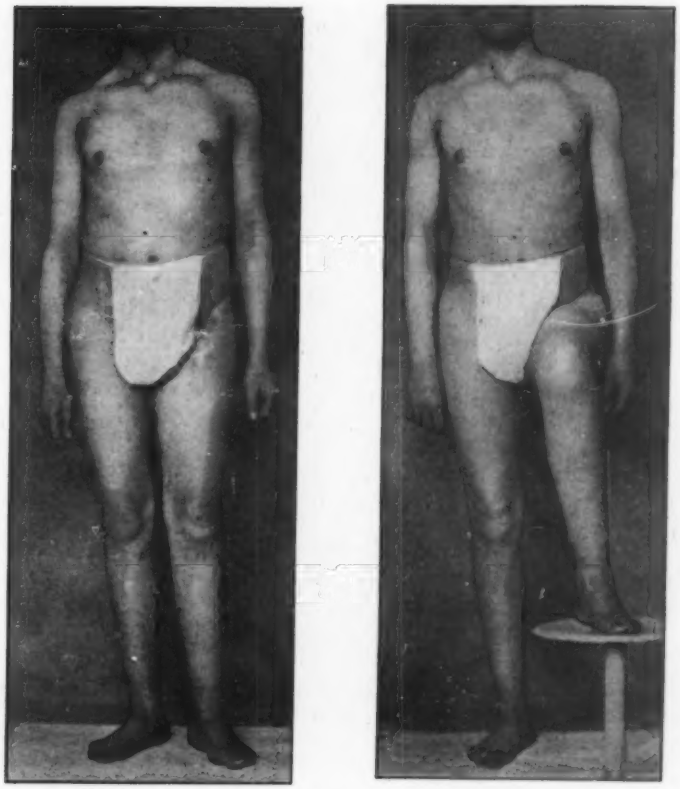

FIG. 6*a*. FIG. 6*b*.
Case 2 at the time of discharge. Shortening 2½ cm. Voluntary flexion 90°. Abduction 30°.

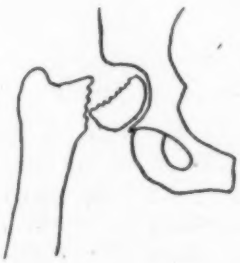

FIG. 7.—Sketch illustrating the x-ray findings in Case 3 at the time of admission.

The patient did not look septic. As his condition was in no way critical, a splint was applied, which fixed the leg in the pathological position, that is flexed to 90 degrees and slightly abducted, with the idea of a subsequent osteotomy to correct the position, provided the infection subsided. The splint was kept on three weeks; during this time the patient was practically free of pain during the day and had only moderate pain at night. There were no evidences of abscess formation, nor did the appearance of the patient change for the worse. The temperature, however, gradually rose and the roentgenogram, taken three weeks after admission, indicated absorption of the bone, with evidences of inflammation extending to the acetabulum. Operation was therefore considered necessary. The incision, a modified Kocher, was planned so as to expose not only the joint, but also the track of the bullet. The anterior portion of the wound was exposed by a separate, short incision, passing through the abdominal muscles above Poupart's ligament. The fibres of the gluteus-maximus were divided transversely; the gluteus-medius and minimus were drawn upward. With practically no hemorrhage and very little trauma, the hip was exposed in this way. The head and neck were completely shattered; the cartilage had almost disappeared; no pus was present, only a thick serous fluid. The head and neck were removed together with the other portion of the acetabulum which, as shown in the X-ray, was infected (see Fig. 8). Abscesses were not present and the cartilage of the acetabulum was normal, except for two small erosions. The trochanter was not infected. The track of the bullet was cleared of small splinters of bone and lead. The acetabulum and the bullet wound were packed lightly with gauze and the leg placed in abduction of ten degrees. The temperature fell by lysis. It did not become normal until one month subsequent to the operation. With the exception of a small abscess, the recovery was uneventful. Four months later, the patient was able to walk about. The hip, however, instead of being movable, as in the first two patients, was rigidly ankylosed. The functional result was, nevertheless, good, since the abduction just equalized the shortening of 3 cm. and enabled the patient to walk with only a slight limp.

Summary: Case 3 differs from the first two in the mild character of the infection, resulting in a serous rather than a purulent coxitis. Resection was indicated because of the gradual extension of the inflammatory process to the acetabulum. The resulting ankylosis was probably due to the fact that comparatively little of the trochanter was removed, thus allowing it to impinge against the roughened surface of the acetabulum.

Case 4: O. M., wounded the 10th of August, 1915, but did not reach the base hospital until the 8th of September. On the outer aspect of the left thigh was an irregular, purulent wound, about 6 cm. long, produced by a large fragment of shrapnel. The ex-ray demonstrated a shattering of the femur just below the great trochanter (see Fig. 9), with coxa-vara formation reducing the angle of the femoral neck to 90°. There was no tenderness over the head of the femur,

FIG. 8.—The shaded area indicates the extent of resection in Case 3.

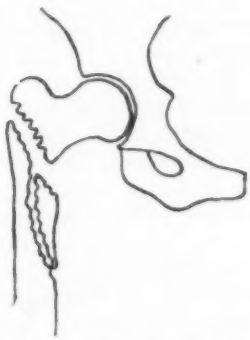

FIG. 9.—Sketch illustrating the x-ray findings in Case 4 at the time of admission.

nor other evidence of involvement of the hip. It seemed, therefore, to be merely a case of severely infected fracture of the femur. The leg was at once immobilized in maximal abduction by means of a fenestrated plaster dressing, enclosing the body to the nipple line. At first the temperature did not rise above 100.5, but gradually, despite careful dressing of the wound and the absence of pus retention, it rose, until by the 9th of October, the evening excursions had reached 103°. At this time, the patient began to complain of pain in the left hip and a slight swelling appeared over the head of the femur. It was impossible, because of the unhealed fracture, to test the movements of the hip joint; but even without these tests the diagnosis was clear. On the following day the operation was performed. The wound of

FIG. 10.—The shaded area indicates the extent of resection in Case 4.

entrance was utilized as the means of approach by prolonging it five centimeters upward and downward. The muscles inserting into the great trochanter were cut off near the bone; this permitted the easy extraction of the head, neck and trochanter. Frank pus was not present, but the joint fluid contained small, purulent flocculi. The cartilage of the acetabulum was discolored, but not eroded. As the upper end of the femur appeared to be infected, 2 cm. were removed by a transverse saw cut. There were no evidences of para-articular abscesses. The entire wound was packed, no sutures whatever were inserted. The temperature remained high. At the first dressing, a slight retention of pus, in the direction of the adductor muscles, indicated the need for further drainage. A counter incision was made on the inner aspect of the thigh and a thick rubber drain passed from the original wound, between the adductor muscles, and out of this second incision. As the upper part of the shaft of the femur was infected, and additional 7 cm. were removed (see Fig. 10). The following week the temperature persisted in its high evening excursion; the pulse was exceedingly weak On the 20th of October, ten days subsequent to the operation, a few drops of pus were seen to ooze from an opening anterior to the joint. Under local anesthesia, an abscess between the tendon of the rectus muscles and the joint was opened. This, however, did not seem to be the only pocket, since several minutes after swabbing it out, it was seen to fill with pus. By pressure on various parts, this was found to issue from a minute canal, which passed upward on the outer side of the anterior crural nerve, beneath Poupart's ligament. This canal was laid open by an incision 10 cm. long, which

passed directly through Poupart's ligament and the abdominal muscles, revealing a retroperitoneal abscess the size of a child's head. One month subsequent the temperature had become normal, and at the time of the discharge from the hospital, May 4, 1916, the patient was able to walk for an hour without becoming tired. There was a shortening of 10 cm.; this was equalized by a cork sole. The patient could flex the hip 40°, abduct it 30° and rotate it 20°.

Summary: Case 4 represents a particularly dangerous and difficult problem, owing to the presence of the large retro-peritoneal abscess. This, unquestionably, was present at the time of the first operation and was responsible for the continuance of the temperature subsequent to resection. Probably much of the shaft of the femur could have been saved, had the abscess been discovered sooner. Significant is the excellent range of voluntary motion at the hip, despite the shortening of 10 cm.

Case 5: K. S., wounded May 20, 1915, reached my hands the 9th of June. Examination showed an extensive, irregular wound in the region of the right groin and thigh, about 20 cm. long and 12 cm. wide. The fascia covering the external oblique muscle of the abdomen lay bare in the mesial portion of the wound; at this point a pus pocket extended upwards. In the mid portion of the wound was a Y shaped pocket, which when probed led to bare bone. There was abundant purulent discharge. The x-ray showed a fracture just below the great trochanter, with marked upward displacement of the shaft of the femur (see Fig. 11). Pressure over the head of the femur caused

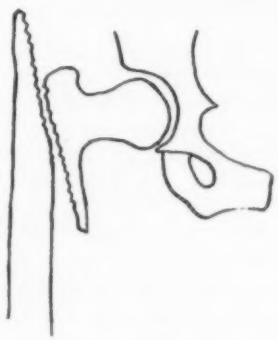

Fig. 11.—Sketch illustrating the x-ray findings in Case 5 at the time of admission.

no pain; the temperature did not range above 100.6. Despite traction of 40 pounds, it was impossible to overcome the upward displacement of the femur. Small abscesses formed in the neighborhood of the fracture, the temperature rose to 103°, the patient was so ill that his life was frequently despaired of, but a frank coxitis did not develop. At no time, despite rises of temperature to 103, was there

swelling over the head of the femur, tenderness to pressure, or evidence of an abscess communicating with the joint. Operation was, therefore, considered contraindicated. Gradually the temperature fell, but not until five months later was it normal. A sinus about five inches long still discharged pus. This led down to the necrotic head of the femur through a 6 cm. incision, the sinus was opened and the head readily removed (see Fig 12). The acetabulum was found cov-

FIG. 12.—The shaded area indicates the extent of the resection in Case 5. Above the acetabulum is shown the bone graft inserted to form an artificial socket for the displaced shaft of the femur.

ered with healthy granulations, no pus was present. The wound now healed rapidly and the patient was soon out of bed. The functional result, however, was poor, owing to the fact that the shaft of the femur was displaced upward and had no hold against the pelvis. It was impossible to overcome the difficulty by traction or by directing the femur towards the acetabulum; therefore, I constructed an artificial acetabulum in the following way:—A transverse incision was made one-half inch above the tip of the femoral shaft. This was deepened through the muscles, down to the outer surface of the ilium; the bone was exposed just above the acetabular margin; with the largest sized Albee bone borer, an opening was made through the entire thickness of the ilium. A section of the cortex of the tibia was then removed, about 7 cm. long by 3 cm. wide. One extremity was narrowed and rounded with the reamer until it fitted snugly into the hole bored into the ilium. The transplant, when placed in position, held firmly. The small fragments of the bone, cut from the transplant, were placed

in the angle between it and the ilium. The wound healed by primary union. An x-ray, two months later, showed an effective buttress which prevented upward displacement of the femur and enabled the patient to walk distinctly better than before.

Summary: Case 5, in contradistinction to the first four, represents the type of arthritis in which, despite the high temperature, nothing was to be gained by an immediate excision of the joint. The septic symptoms were due to the severely infected comminuted fracture, not the joint involvement. It was, therefore, wiser to wait until the joint was walled off completely by granulations, before removing the necrotic head. By postponing the operation, the risk of operative mortality was markedly diminished. The poor functional result was due to the improper splinting during the transportation, which allowed the shaft of the femur to be displaced so far upward that it could no longer be directed towards the acetabulum.

The study of these five cases helps us to realize, that in dealing with infected gunshot injuries of the large joints, the first consideration is the life of the patient. Injuries to the hip, in particular, are to be regarded as among the most dangerous wounds of modern warfare. Extensive series of hip infections, dating from this war, have not, to my knowledge, been published thus far. Goebel reports a mortality of 60%, based upon experiences in the Balkan war. In the Spanish-American War, there was a mortality of 33 1/3%. Langenbeck, summarizing the results during the War of 1870, reported a mortality of 71% of those treated conservatively, 83% of those resected, 100% mortality in those instances in which an ex-articulation was performed. In deciding upon the best course of treatment, the operator should, I think, be governed by the principle of removing the pus focus as effectively as possible and with minimal shock to the patient. Simple drainage in the presence of a shattered, infected bone will not suffice. Disarticulation at the hip gives opportunity to clear away the septic focus, but the shock involved is very great. Excision is unquestionably the operation of choice.

HISTORICAL SUMMARY.

Resection of the head of the femur was first proposed by the English surgeon, Charles White, in 1769, who performed the operation only on the cadaver. The first operation on the living subject is credited to another English surgeon, Anthony White. The patient, a boy suffering from tuberculosis of the hip, survived the operation and the symptoms subsided. Oppenheimer, a German in the service of the

Russian Army, was the first to undertake the operation for gunshot injury to the hip joint (1829). For 17 days the progress of the patient was uninterrupted, then he succumbed to an intercurrent disease. The first successful case dates from the Crimean War. The patient, operated by the English surgeon, O'Leary, not only survived the operation, but was able to walk about with a fair degree of movement at the hip; there was a shortening of only 5 cm. Particular emphasis was given to this method of treating gunshot injuries of the hip joint by the classical report of our own surgeon, Otis, who, in 1869, collected 63 cases of excisions of the head of the femur performed during the Civil War, and 22 earlier cases. Although the mortality was very high—over 90%—he strongly advised this operation rather than exarticulation at the hip. He divided the cases into three categories: The primary operations, i.e., those performed during the first 24 hours, before the inflammatory reaction had a chance to develop; second, the intermediate resections performed during the period of most marked inflammatory reaction; third, the secondary operations, after the inflammatory reaction had ceased. This classification, which Otis adopted from Boucher, was justified: (1) By the marked pathological differences dependent upon lapse of time since the injury; (2) by the variation in the operative results during the three periods. This is made clear by a glance at the following table:

Resection	Total	Died	Mortality
Primary	39	36	92.3%
Intermediate	33	30	90.9%
Secondary	13	11	84.6%
	85	77	90.6%

Technique of the Operation: It is inadvisable to recommend a single incision applicable to all cases, since it should invariably be so planned as to expose not only the joint, but the entire course of the projectile. In two cases I employed vertical incisions posterior to the tensor faciae. In one case anterior to the tensor; in the other two cases, horseshoe shaped incisions were necessary. Whatever incision be used, the amount of damage to the muscles need not be great. The glutei and other muscles inserting into the great trochanter can be turned upward; in case the gluteus-maximus has to be divided, its fibers can be brought together at the conclusion of the operation.

Pathology: The essential in the management of these cases is a clear recognition of the pathology of the lesion. The purulent coxitis can arise either by a direct injury to the capsule or to the bones form-

ing the hip joint, or secondarily, by an excision from an adjacent focus. As an example of the latter type, witness the first case in which an injury to the ischium was responsible for the involvement of the hip joint. As soon as it is evident that the head of the femur is entirely separated from the shaft, one can assume with certainty in the presence of infection, that it will gradually become necrotic. The extent of involvement of the bones of the joint depends upon the grade of infection. When virulent, as in the first case, the entire acetabulum and portions of the ilium, ischium and pubis are likely to become involved. Particularly dangerous are the para-articular abscesses. They can form between any muscular planes and, owing to the diminished vitality of the patient, they are very difficult to detect. In addition to the gluteal region and the thigh, abscesses may travel upward beneath Poupart's ligament and involve the retro-peritoneal area. Their presence constitutes one of the most difficult phases in the after-treatment. It is advisable, at each dressing, to hold the wound wide apart with long, narrow retractors and explore each recess by means of strong artificial light.

Prognosis: With proper surgical care the lives of a great majority of patients should be saved and a satisfactory function should be secured. Whether a pseudarthrosis or an ankylosis results, seems to be of comparatively little significance. In all cases, with the exception of the last, a firm, weight-bearing joint was secured. The motion present was certainly of advantage to the patients.

Comparisons with Other Joints: It would be foolish to base the treatment for other joints upon this experience with the hip, since the problem involved is an anatomical one and each joint has so many peculiarities as to place it in a class by itself. Most nearly akin to the hip joint is the shoulder. Of four cases which I treated, in which the head of the bone was shattered and infected, I resected in every instance. One patient died of parenchymatous oozing from the entire surface of the wound. The other three recovered with pseudarthrosis and voluntary abduction, averaging 45°. Other cases which I saw, in which 5-8 cm. of the shaft had been sacrificed, were functionally poor results. At the elbow and at the wrist, I have always avoided resection by very free drainage anterior and posterior to the joint. The soft parts are lifted away *en masse* from the injured bones. In deciding upon the position of immobilization I follow the rules laid down by Sir Robert Jones. The knee joint has, in my experience, been the most difficult joint in which to control infection

Neither drainage nor excision availed in the majority of cases. In 12 cases out of 18 I was forced to amputate, to save the patient's life. At the ankle conditions are analogous to the wrist. By lifting away all the tendons from the joint, free drainage can usually be secured. When the astragalus has been shattered and the infection is severe, astragalectomy does not help. In three cases in which this measure was resorted to, amputation had to be performed soon afterward to control the sepsis.

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A REPORT ON THE CLEVELAND AND ELYRIA CRIPPLE SURVEYS.*

BY WALTER G. STERN, M.D., CLEVELAND, OHIO.

The Cleveland Cripple Survey grew out of questions in the minds of people interested in child welfare work, as to the general condition and industrial chances of the handicapped.

The Committee on Cripples making the survey was composed of representatives from the Cleveland Foundation, the Cleveland Welfare Council, the various hospitals, dispensaries and social agencies caring for crippled children, the public and parochial schools, the Anti-Tuberculosis League and the several foreign consulates.

The purpose of the Cripple Survey was to discover the economic and educational needs, the capacities and possibilities of the children and adults in Cleveland who are handicapped because lacking the normal use of the skeleton or skeletal muscles, and to make such recommendations for meeting these needs, as the facts brought out by the survey may suggest.

A cripple is defined for the purpose of the survey as "a person whose muscular movements are so far restricted by congenital defect, results of disease or accidents as to affect his capacity for self-support." The heart cripple and the blind have been excluded.

The hospitals, dispensaries and social agencies contributed the original list of cripples. A certain poor district of the city known as the "Lake" district, inhabited chiefly by immigrants from the Austro-Hungarian Empire, was posted as the first district to be canvassed. More than 65% of the total number of cripples found in this district were *not* on the original list of cripples, but were discovered by the house-to-house canvass. This method was then applied to the whole city. For convenience, the city was divided into eight districts, and a preliminary report secured from practically every family in the city, rich and poor alike. A schedule of questions was then filled out by the more experienced workers on a follow-up visit.

A total of 4,186 schedules were collected by a staff of 38 workers, in 12 months. For the past 12 months a summing up of the schedules and an analysis of the figures has been going on; the complete report is now published and can be secured by those interested, from the publishers or the Cleveland Welfare Council.

The analysis gives not only information as to the size and nature of

* Read at the Pittsburgh meeting of the American Orthopedic Association, May, 1917.

the problem, but practical guidance toward a community plan for promoting the welfare of the cripples.

The collecting of the schedules was found to be very easy. We had both amateur volunteer workers, mostly students of sociology in the local university, and more experienced, paid social workers. The acceptance of them in all neighborhoods was most pleasant and reassuring with only a few exceptions; probably less than 100 out of approximately 150,000 families, refused to give any information. When one considers the various types of people in the different economic classes. and the fact that they were calling upon our own initiative rather than by request, the results seem almost beyond expectation. Many families were genuinely interested in the work and voluntarily wrote to the office expressing their approbation and offering to assist in any way that was within their means. The news of the canvassing spread from one street to another, and from one end of the city to the other with rapidity, and, fearful that they might not be included in the canvassing, parents, or brothers and sisters, telephoned or called at the office to give the names of cripples in their families; and it was apparent that they were not looking for material help, for this was often from families where the cripple was entirely self-supporting. Sensitive cripples and those of the recluse type were glad to give anything from their experience, however encouraging or discouraging, if it would be helpful to other cripples. Many fathers voluntarily took their dinner hour to come to the office to give information about their crippled children, and to ask advice about a normal plan for their future. A few pathetic letters have come from outside the city, where cripples had learned of the work through the newspapers.

The canvassers prepared the way for the trained survey workers, and the second visit, instead of being considered a nuisance, was welcomed with interest, and it was most evident from this spirit that the canvassers had been both tactful and friendly in their approach to the families and had gained their coöperation. It was with genuine regret that many of the workers finished this part of the work, which seemed at first so difficult, but proved to be an interesting and unusual opportunity.

In all 4,186 survey cards for tabulation were completed in 12 months, at a cost of $8,505, and it was estimated that to complete the survey another $4,000 would be needed, which estimate has been shown to be approximately correct, so that it has cost a total of $12,500 to complete this survey of 4,186 names.

It was established that 65% of our cripples were not known as such to the public free dispensaries, charitable and other social agencies. This condition is surely local and is most easily explained. Cleveland is an industrial city of 750,000 people; its industries are so diverse that industrial stagnation is never quite so acute in times of business depression as in other centers, such as Pittsburgh, Birmingham, Minneapolis and others, which depend chiefly upon one or two great industrial branches. Although it is the second center in the United States for the garment and clothing trades, sweat-shops are practically unknown. The laboring class live chiefly in detached houses or cottages situated on lots of ground averaging about 25-100 feet in area, and the building code is so extremely rigid that the unhygienic tenements so unfavorably known in many of our large cities are practically unknown. Despite the extremely large foreign population (it is estimated that immigrants from the Austro-Hungarian Empire and their descendants comprise over 50% of our population), extreme poverty is rare. Then, too, charity, hospital and dispensary abuse (by those able to pay for medical treatment), such as is so prevalent in many large cities, notably New York and Philadelphia, has been entirely wiped out by a vigorous campaign on the part of the local Academy of Medicine and by the coöperation of the hospitals and dispensaries in a charities clearing-house. With this charities clearing-house in operation, no unworthy applicant can receive free treatment, nor can a free patient run from one hospital or dispensary to another, as so many wish to do; daily reports are made and sent out and repeaters and floaters have been absolutely eliminated. Every applicant for free medical attention must show his need for same. In any case of doubt the applicant is favored; but a special investigator, preferably one speaking the language of the applicant, is given the card to investigate. In this way the expenses of treating impostors and of having patients treated by more than one agency at one time have been eliminated and organized medical charity has been made more efficient and effective.

A few of the interesting findings of the survey are as follows:

Ratio of cripples to population, 6 per 1000 inhabitants.

AGE AT TIME OF SURVEY.

Under 5 years	165	
" 10 "	416	936 or 22%
" 15 "	355	
From 15 to 60 years	2553	or 61%
Over 60 years	697	or 17%

Color and nativity followed the figures of the population for the city at large.

AGE AT OCCURRENCE OF DISABILITY.

Birth or under 5 years	1400	33%
From 5 to 10 years	352	8%
" 10 " 20 "	546	13%
" 20 " 30 "	509	12%
" 30 " 40 "	395	9%
" 40 " 50 "	370	9%

Forty-three per cent. of the whole group became crippled during working age. 33% became disabled under the age of 5, while 50% became crippled before the age of 15. The problem of the cripple is first one of childhood and second of working life.

AGE OF OCCURRENCE.

FORM OF DISABILITY		NUMBERS Total	Under 5	5-14	20-49	50-59	60 and over	Not stated
All forms		4186	1400	646	1274	294	273	47
Loss of hand or arm	One	188	5	24	112	10	3	0
	Both	6	0	0	4	1	0	0
Defect of hand or arm ...	One	499	101	63	223	29	10	5
	Both	42	15	3	14	6	2	0
Loss of foot or leg	One	466	19	114	244	19	16	1
	Both	27	1	4	19	0	1	1
Defect of foot or leg	One	1546	706	274	292	98	98	16
	Both	365	163	26	84	39	40	6
Loss or defect of one or both upper and of one or both lower limbs		332	115	24	103	33	51	1
Deformity of body		199	122	52	10	2	5	5
Paralysis of body		6	1	0	3	1	0	0
Both		0	0	0	0	0	0	0
Not classified		67	20	29	13	1	1	2
Disability of upper or lower limbs, or of both and the body		443	132	33	153	55	46	10

MAIN CAUSES OF DISABILITY	NUMBERS Total	Males	Females
All causes	4186	2638	1548
Congenital	301	136	165
Accident at occupation	468	457	11
Other accident	1323	966	357
Infantile paralysis	525	289	236
Other diseases	1437	724	713
Not stated	132	66	66

To summarize: 301, or 7%, of the disabilities were due to congenital causes; 1791, or 43%, to accident; 1962, or 47%, to disease; and in 132 cases, or 3%, the cause not learned.

Causes in Children below Age of 15.

Congenital	149	16%
Accident	87	9%
Infantile paralysis	382	41%
Tubercular joints and bones	139	15%
Other diseases	148	16%
Not classified	31	3%

Attendance of Children at School.

Form of Disability		Total	Regular Classes	Special Classes	Not at School
All forms		771	415	110	246
Loss of right arm	Below elbow	0	0	0	0
	Above elbow	1	1	0	0
Defect of right hand		11	7	1	3
Defect of right arm		12	9	1	2
Loss of left hand		1	1		
Loss of left arm	Below elbow	1	1	0	0
	Above elbow	0	0	0	0
Defect of left hand		12	11		1
Defect of left arm		18	15		3
Loss of both hands		2	2		
Loss of both arms		1	1		
Defect of both hands		5	4	1	
Defect of both arms		3	2		1
Loss of foot		8	7	1	
Loss of leg	Below knee	10	9	1	0
	Above knee	12	8	1	3
Defect of foot		44	26	4	14
Defect of leg		324	198	36	90
Loss of both feet		0	0	0	0
Loss of both legs		0	0	0	0
Defect of both feet		10	8	1	1
Defect of both legs		78	13	24	41
Loss or defect of one or both upper and one or both lower limbs		68	36	12	20
Deformity of body		68	34	11	23
Paralysis of body		1			1
Not classified		30	12	5	13
Disability of upper or lower limbs, or of both limbs and of body		53	12	11	30

OCCUPATION (ABOVE AGE OF 15).

FORM OF DISABILITY		NUMBER At Work	NUMBER Not at Work
Total		1912	1338
Loss of hand or arm	One	147	37
	Both	3	2
Defect of hand or arm	One	341	86
	Both	20	15
Loss of foot or leg	One	314	115
	Both	14	13
Defect of foot or leg	One	721	389
	Both	81	165
Loss or defect of one or both upper and of one or both lower limbs		76	174
Deformity of body		73	53
Paralysis of body		3	2
Not classified		10	27
Disability of upper or lower limbs, or of both and of body		109	260

OCCUPATION	NUMBERS Male	NUMBERS Female
Total	1319	593
Manufacturing and mechanical industries	615	77
Transportation	192	10
Trade	201	24
Public service	65	1
Professional service	45	16
Domestic and personal service	80	44
Clerical occupations	49	21
Not classified	36	0
Housewives	0	400

ABILITY TO WORK (ABOVE THE AGE OF 15).

	NUMBER Total	NUMBER Male	NUMBER Female
	2553	1738	815
I. Not seriously handicapped for normal occupation	753	566	187
II. Able to work at selected trades and processes	1142	835	307
III. Disabled (*i. e.* for work alongside normal persons)	658	337	321

REASONS FOR UNEMPLOYMENT.

	NUMBER Total	NUMBER Male	NUMBER Female
	859	543	316
A. Need of placement at selected trades and processes	189	133	56
B. Need of special training or special conditions of work	130	108	22
C. Need of home or hospital occupation	45	15	30
D. Not classified	495	287	205

CONCLUSIONS FROM STUDY OF SURVEY..

A. Children.

"1. The problem of the crippled population is first of all a problem of child welfare. Although the adults were more numerous than the children—more than three times as many—a fourth of the crippled population were not only under the age of 15 at the time of the survey, but a third of adult cripples became disabled while under the age of 15. Thus a total of 49% of the whole group were disabled in childhood.

2. As a children's problem it is essentially a medico-educational one. The nature of the causes and the form of the crippled condition, the consequent length of time and well-known conditions of life and treatment needed to minimize the handicap, require that provision for medical and educational care be planned in close relation to each other.

3. The varieties of muscular and skeletal defects are so many, and crippled persons, like normal ones, have so great a variety of aptitudes, that no single or simple means will satisfactorily provide for their vocational preparation.

4. The existing special provisions for the care of crippled children are inadequate, especially in their equipment for correlating medical and educational care and for fitting crippled children for working life.

B. Adults.

5. The problem of the crippled population is, secondly, a problem of adults in working life. The number who are over 60 years of age is small, the number of these who became crippled after 60 is still smaller. But the number becoming crippled during working life by accident, especially of men, is large, and the number crippled from all causes very large.

6. Cripples in Cleveland, under heavy physical handicap, in direct competition with others, and without special favor of the community, have reached and held remarkable positions of economic independence. Their capacity, occupations and earnings point on the whole to varied and normal tendencies of life.

7. The great variety of forms of handicap and notable difference in aptitudes and experience prior to becoming crippled, point to the need of a most flexible system of service to those among cripples who cannot make their way unaided, but who may be benefited by special plans for their rehabilitation and reëducation.

8. The increased care with which, under existing laws, employers

tend to avoid the added risks of liability in employing physically handicapped labor, place the handicapped, however capable they may be, at an increasing disadvantage, except at times and in places where other labor is difficult or impossible to secure.

RECOMMENDATIONS.

In order that the needs of both adults and children in Cleveland may be met, *a central bureau*, or federation of agencies interested in cripples, is required, that would represent not only existing agencies especially instituted for cripples, but all the forces touching their lives most closely—medical, educational and industrial. Its program should be carefully worked out for the "long run" on the basis of the facts brought out by the survey and considered both in the light of local resources and the experience of other states. Such an organization should, among other things, work for adequate medical-educational care for crippled children closely correlated with the school system; devise the various means of safeguarding the interests of crippled adults (or aim at a separate organization to be devoted to those ends); and secure (provide, if necessary) the training of workers able to carry out its program. The "various means" for adults will include legislation adjusting, for employer and employee alike, all matters of compensation and insurance that now stand in the way of reëmployment; provision for the application of all that has been learned through the war of use of appliances, and early vocational estimates and preparation, as well as the more familiar principles of occupational therapy in the convalescent period—provision for industrial training for the competent among the handicapped as a part of an adequate system of industrial training for all citizens; special provision for placement of those who cannot place themselves and for the special employment or home-industry of semi-invalid cripples capable of taking some small part in active life. Above all, and through all, this work must run the purpose of preventive effort to forestall crippled conditions from accident, infantile paralysis and other disease—study, educational campaigns and legislation, if necessary, that no needlessly crippled persons shall be added by disease or accident to the population."

While this was being done in Cleveland, another survey of quite a different kind was made by the trustees of the Gate's Hospital for Crippled and Deformed Children, of Elyria, Ohio, of which I am the

directing orthopedist. The hospital is situated 25 miles west of Cleveland, in the City of Elyria, in Lorain County. Ohio.

When the suggestion was made to the trustees of the Elyria Memorial Hospital Association to build and endow a hospital for crippled children, it was deemed best to make a canvass of Lorain County to see how great was the local need for such an institution. This was done by canvassing all the schools and school children, physicians, charitable and church organizations, Sunday schools, etc. No house-to-house canvass was made, but the enumeration must have been most complete, as witnessed by the greater proportion of crippled children found, over the number reported in Cleveland. Only cripples under the age of 14 years were tabulated, because it was felt that in an institution, such as was proposed, the greater good could be accomplished by limiting it to children.

In Lorain County, population, 100,000, were found 251 crippled children; ratio, 1 to 400 of population. They were mainly situated as follows:

Lorain City, population, 40,000; 105 crippled children; ratio, 1 to 381. Prosperous industrial city. Iron and steel foundries, ship building and coal docks; 35% foreign population.

Elyria City, population, 20,000; 55 crippled children; ratio, 1 to 364. Manufacturing city. Steel and iron specialties. Small foreign population.

Amherst Village, population, 2,500; 18 crippled children; ratio, 1 to 150. Stone quarries. 85% foreign population. Hygienic and industrial conditions very poor. Recent epidemic of infantile paralysis.

Oberlin City, population, 4,500; 14 crippled children; apparent ratio, 1 to 320; real ratio, 1 to 525. No manufacturing. College center, with 3,000 college students not enumerated in above population estimate. Hygienic conditions excellent.

Wellington, population, 2,500; 12 crippled children; ratio, 1 to 209. Farming community. No manufacturing. Recent epidemic (1915) infantile paralysis.

Practically 50% of all the cripples of Lorain County were found in families who could not afford to pay for the proper medical treatment and education, even if proper facilities could be provided. This led to the building of a 45-bed orthopedic hospital in the City of Elyria, on the spacious grounds of the Elyria Memorial Hospital. To more correctly determine what calls would be made upon it by other counties and to decide in reference to the future growth of the insti-

tution, it was deemed best to make a similar census of the adjoining counties, from which we have learned as follows:

Erie County, population, 46,000; 117 crippled children; ratio, 1 to 393. Chiefly agricultural; some light manufacturing in the City of Sandusky. Very small foreign population.

Sandusky County, population, 41,000; 73 crippled children; ratio, 1 to 564. Strictly agricultural district. No recent epidemic of infantile paralysis. Living conditions excellent.

Huron County, population, 40,000; 101 crippled children; ratio, 1 to 396. Chiefly agricultural; some light manufacturing. Very small foreign population.

Ottawa County, population, 23,000; 52 crippled children; ratio, 1 to 442. Rich agricultural and fishing community; a few cement and gypsum mills. Very small foreign population. No recent epidemic of infantile paralysis.

It is thus estimated that in an agricultural and manufacturing center, when people are prosperous and where living conditions are good without having had a recent epidemic of infantile paralysis, the ratio of crippled children to population is about 1 to 400; where the people live under unhygienic conditions, or where there has been a recent epidemic of infantile paralysis, the ratio of crippled children to the population may increase in these centers to as high as 1 to 150 of population.

In making this last survey we did not feel the necessity of analyzing every case. It was simply an enumeration made for the purpose of finding out the number of crippled children, where they were located, what class of homes they came from, how many would be charity, how many would be part charity, and how many could pay. We found that in taking this survey, which was done by one trained person in nine months, at the expense of approximately $500 for this part of the work, that the expenses were paid tenfold by the interest the various communities took in the work, and the donations made for the support of beds by the counties investigated.

TARSAL TORSION IN WEIGHT BEARING.

BY WILLIAM JACKSON MERRILL, M.D., PHILADELPHIA, PA.

MUCH has been written concerning the arches of the foot. The analyses of their conformation and relation to function are somewhat contradictory. One finds in the anatomical delineations of many writers a very consistent exposition of the structures which compose the various arches. In the true sense, the structures of the foot do not conform to the principles of a true arch. First, because a true arch, mechanically, is composed of similar segments forming a curve to span a given space, transmitting their own and superimposed weight mutually, transforming the vertical to a lateral stress, and rest upon fixed abutments. Secondly, the arrangement of the bones and soft parts is analogous to the principles of a suspension span, the sustaining cables being the extrinsic muscles chiefly and the intrinsic muscles to a lesser degree. The plantar ligament replaces the sustaining force of the abutments of the true arch, but the structure formed in this manner is a flexible suspension principle rather than a rigid fixed support, and inasmuch as it is a flexible and slightly elastic structure, depending in its supporting force upon the foot muscles, it enters into the complex structures of the foot as a suspension fundament.

Granting that these values of the component elements of the foot are true, the structural importance of the suspension elements is greater than that of the supporting levers. In the correction of static defects, the attention should chiefly and primarily be directed to the abnormal condition of the soft parts. Undoubtedly the misleading expression "broken arches" originated in a conception of a true arch principle and that the flattening of the foot occurred because of a break in a given arch. When this notion predominates and the constitutional cause and the muscle disorders are ignored, the fallacious practice of simply "propping up the arch" often is employed.

The physiological and mechanical integrity of the foot is preserved or altered proportionately as the forces are applied to it in the normal direction of weight-bearing force or in planes deviating from the normal; therefore, the importance of alteration in the normal static relationship of legs, thigh, and pelvis must be reckoned with. Assuming that the weight is borne equally and reciprocally on the extremities, and that the normal gravity stress is altered, definite mechanical deviations will follow in the structures below the part which has been

affected. If the pelvis be rotated backward, the entire lower extremities tend to rotate outward, and the maintenance of this change is apt to continue with a toe-out position of the feet. If this change be continued, the toes deviate farther from the sagittal plane, increasing the added cross strain to the tarsus, plus the stress of weight bearing. Weakness of the external rotators of the legs allows the thigh and leg to rotate inward, whether or not the feet maintain their normal direction, but there is a change in the stress of the foot brought about by deviations in the line of weight bearing. The strain noted, plus the added torsion stress, is especially severe when relaxed knee joints are slightly bent, and when pronated and flattened feet coexist. The deviation of the toes increases proportionately with the position and condition of structures mentioned, and when constitutional maladies coexist, structural and mechanical alterations progress. When the normal relationship of the structures of the foot is altered, there is certain definite movement of the component parts. The os calcis rotates on three axes: forward on the transverse, inward on the vertical and longitudinal. The scaphoid rotates backward on its transverse, inward on its longitudinal and vertical axes. The inward rotation of the os calcis on its longitudinal axis varies in proportion to the relaxation present. The altered position of the os calcis measured by its deviation from the normal range of motion may be taken as an index of the flattening of the foot. Normally the lateral play of the astragalus is slight, but the anterior breadth of its trochlear surface is slightly greater than its posterior breadth. When the forward and downward movement of the os calcis and astragalus occurs, the lateral play is increased, adding another factor to the flaccidity present. The lateral movement of the foot is greater when the foot is extended than when it is flexed on the leg, owing to the cuneiform shape of the trochlear portion of the astragalus and the increased tension of the lateral ligaments. When the subastragalar movement in a joint is increased by the relaxed state of the soft parts, there is a greater deviation of the os calcis from its normal play. The movement in the midtarsal joint carries the midtarsus to a lower plane and the proximal heads of the first four metatarsal bones move inward with abduction of the antitarsus, owing to the obliquity of the midtarsal joint.

The antitarsus has been defined as the structures anterior to the mediotarsal joint, but the tarsus is composed of the bones of the foot posterior to Lisfranc's line. The article, for convenience sake,

refers to the bones anterior to that line as the antitarsus, dividing them into five segments, each composed of a metatarsal bone, its phalanges, and the tarsal bones which enter into its continuity.

The longitudinal arches may be considered from this point of view of two groups: the first, three segments abutting against the scaphoid as a keystone; the second group, the fourth and fifth segments abutting against the cuboid as a keystone. The first four segments have a definite arch. In the normal position of weight bearing, the five metatarsal bones rest upon the ground and therefore act as abutments. These arches diminish in curves outwardly. When the distal ends of the metatarsal bones spread beyond their normal range, the plane of the arches is deviated from the normal, adding a weakening factor. The transverse arch formed by the proximal heads of the metatarsal bones is of importance, since it is the confluence of stabilizing forces of the foot. The arches taken collectively form a segment of an inverted dome. The os calcis and astragalus, the complement of the metatarsal segments, depend for their position upon the muscles chiefly. The arches formed by the antitarsal segments are supported by their complement of the dome, at the scaphoid and cuboid.

In walking, the oscillating movement varies the line of gravity. The normal weight-bearing position of the lower extremities in standing places the structures in such a position that the plane of weight-bearing force passes through the center of the head of the femur and a point inward to the center of its condyles, slightly inward to the center of the lower end of the tibia, the astragalus and the os calcis, outward to the center of the scaphoid and great toe. The axes of the legs should be parallel; the inner malleoli should be separated about one-third the distance between the heads of the femora, and the longitudinal axes of the feet should be parallel. The fixed supporting points are the lower surface of the os calcis, the tuberosity of the fifth metatarsal bone, and the distal heads of the metatarsal bones.

This article does not take cognizance of an anterior arch since in normal feet the distal heads of the metatarsal bones transmit pressure directly to the ground and do not so conform as to mutually transform the vertical to a horizontal stress, and do not have a substructural element to act as abutments.

Under normal conditions, the curve of the longitudinal arches is in a vertical plane, and stress is applied in harmony with the plane of weight bearing. When pronation or flattening or both takes place and the proximal heads of the metatarsal bones move inward, the sup-

porting power is diminished proportionately as the deviation. Increased strain is imparted to the sustaining soft parts. As the midtarsus and the proximal heads of the metatarsal bones are displaced mesially, inward rotation of the first four metatarsal bones takes place, imparting a torsion stress to the metatarsal bones and the midtarsus, and adds abnormal strain to the supporting ligaments. If the movement of a joint, even when it is in a normal condition, be carried to its physiological limit and held there for any considerable period, mechanical irritation is set up and vaso-motor changes occur, the inherent nerve filaments are stimulated and pain is induced locally or may be referred to other parts.

The pain varies proportionately as the amount of stress and the continuance of the extreme movement. Pain resulting from the torsion of the tarsus is localized at the point of greatest stress or is referred forward, which is more generally the case, and may be periodical or continuous. When this torsion stress is maintained and the flaccid, extrinsic and intrinsic muscles are overstimulated, muscle fatigue takes place, and strain pain is induced. When a structure is irritated, there is a voluntary or subsconscious effort to so alter the position or relationship as to protect the threatened part. Irritation of the soft parts of slight internal strain of the foot structures can set up violent action of a muscle or group of muscles, and produce strain and spasm pain of an intense degree, and the trivial cause be overlooked, when the two conditions are remote. Continued hyperstress will bring about tonic spasm followed by exhaustion, loss of tone and power, and muscle flaccidity. The damaged muscle is urged to carry the normal load which is beyond its power and the overstimulation applied to it becomes a potent irritation.

The foregoing discussicn is applied to flaccid, weak feet, in which there is an inward torsion. Outward torsion of the tarsus is found in feet more or less contracted. In such feet, the torsion mechanism is the reverse of that of the flaccid foot. Here is found an increased arch, a shortening of the plantar ligament, spastic contracture of the posterior muscles, especially of the posterior tibial, which often maintains such a force as to tilt the os calcis backward, partially subluxating upward the os calcis on the cuboid. Spasm of the long flexors of the toes adds another factor in the outward torsion of the foot, because they contribute a considerable force in supination.

Clinically the flaccid foot is found more frequently than the contracted type. It seems beyond peradventure that these complex con-

ditions are positive factors in the production of pain in the muscles, also pain variously located about the tarsus, and the extensively discussed pain of the anterior metatarsal region.

Treatment: The treatment of postural defects is primarily the removal of constitutional predisposing factors, since static disorders unassociated with some systemic malady are in the minority; and secondarily, treatment consisting of improvement of affected structures with the use of mechanical devices.

Constitutional maladies have a direct relationship to static defects. They can always be determined and in the majority of cases, can be corrected. Malpositions in weight bearing, improper shoes, inflammatory conditions of the integument, joint structures, ligaments and muscles must first be alleviated. As soon as the foot structures warrant it, the tone and power of the muscles should be improved by massage, local applications and exercises. Static defects, such as the internal rotation of the legs and malposition of the pelvis, should be corrected by exercises and the practice of good posture. The maintenance of good posture in weight bearing to minimize the strain in the performance of function is most essential. The habit of "toeing straight" or slightly inward, with the encouraged use of the supinator muscles, throws the weight to the outer line of the foot and diminishes the strain on the inner, weaker side of the foot.

Rest will decrease the period of convalescence when it can be practised, but the majority of patients must continue their vocations, and mechanical devices must be employed to sustain the therapeutic measures until the rehabilitation of normal health and function have been established. At this juncture mechanical devices should serve their temporary purpose. They are almost infinite in variety and are widely used. Arch props are incompatible with the physiological and mechanical principles of treatment. A slightly flexible and elastic support acts more harmoniously with physical structures, since nature abhors rigid coercion.

Extreme pronation can be most satisfactorily corrected by a sling support which is secured by an upright on the outer side of the foot and leg, to act independently or in conjunction with shoe supports. Mild pronation needs simply exercises alone, or combined with shoe devices. A means which exerts pressure directly upon the ankle creates discomfort and abrasions.

When a device is placed under the foot for the correction of any one or more of the postural defects, there are certain very important

points which should be taken into consideration. This article has laid emphasis on the discursions of the segments of the tarsus and antitarsus, and emphasizes the importance of reversing these abnormal movements in the correction of static defects.

When simply pronation exists. the fault is generally in the muscle structure. Flattening is primarily due to the muscular affections. In taking into account both conditions here, physiological errors, not traumatism in its gross sense, are considered.

The discursions of the os calcis are favored by the relaxation of the plantar structures, but they may occur when these structures are intact. In any case, the os calcis may be taken as the keynote of normal position of the foot and as a starting point, both of the defect and its treatment. It follows, then, that the device employed must so act as to reverse the discursions. Whatever means is employed, it must be so organized with the shoe as to give stability. A device within the shoe and not firmly fixed to it furnishes a wabbly support. Granted that the associated deviations commenced with the os calcis, correction may begin with it. The following constituents of the shoe are essential: A closely fitting heel with stiff counter, a pliable upper which is roomy beyond the vamp seam, a boxing and cap if desired. The top should fit in such a manner that when laced it will not constrict the ankle or hamper movement. The vamp seam should not be placed anterior to the proximal margins of the heads of the metatarsal bones. A wedge, base inward, is placed under the heel; the head is floated inward and extended forward; the inner counter is carried as close as possible to a mid point on the inner surface of the os calcis; the shank must be securely fastened to the heel and practically cover the space within the rand. It should have a mild spring temper and be thick enough to sustain the weight without yielding permanently. It is carried forward to rest upon a prism, so placed that its anterior margin engages well with the posterior contour of the metatarsal heads. The prism must be secured to the shank in order to accomplish a stabilized relationship with the heel. On account of the mild malleable qualities of the shank, increased support can be applied to the foot at the desired point from the heel to the ball by bending the shank. If the heel and ball support are not mutually fixed, the thrust of walking and uneven surfaces permit a divergence of their function and a twisting of the foot. The essentials of this method may be placed within, but must be secured to, the shoe. The fifth antitarsal segment is normally on the ground. Any

device which raises the distal end of the metatarsal bone, tilts it in such a manner as to strain the metatarso-phalangeal joint and to force it against the upper of the shoe; therefore a prop at this point should be combined with a lift under the proximal end to raise it disproportionately, or it should remain parallel with the ground.

The writer was afflicted with tarsal strain and its consequent pains. In order to know the sensations of treatment, he employed every conceivable means of relief. Many of them relieved the astragalar cuneiform pain and lessened the metatarsal pain, but the device which tilted up the distal end of the fifth metatarsal bone created an unbearable pain in its distal joint. This pain ceased after the use of the following wedge: Two truncated prisms were so placed that the maximum thickness was on the mesial edge of the sole. It tapered forward and backward to a thin edge and outwardly diminished gradually to the fifth metatarsal bone, where it was shaped to leave a de pression in the insole as a bed. This mesial bi-prism was secured to the shank, having on its upper surface a steel plate to receive the shank and below a sheet of rubber to prevent squeaking.

In the majority of cases is it not a fallacy to place a wedge with its base inward under the ball of the foot? The discursions of the tarsal bones in pronation and flattening of the foot created a divergence of the transverse axes of the tarsal segments and the ball of the foot. If a wedge be placed under the latter, this divergence is increased and it follows that the strain is made greater. The normal position of the ball of the foot is parallel with the ground and should remain there, except when inflammatory conditions make it impossible, and the foot *in toto* should be tilted.

In conclusion, the writer desires to state that static pains, localized in various parts of the foot, have been relieved when torsion of the tarsus and antitarsus was erected and no other measure employed; it therefore seems fitting to recall the emphasis laid upon the action of torsion stress and its correction by producing reverse movements to the discursions in the various segments of the foot.

PRODUCTIVE OCCUPATIONAL THERAPY IN THE TREATMENT OF THE DISABILITIES OF THE EXTREMITIES.

BY E. G. BRACKETT, COLONEL, MEDICAL CORPS, U. S. A.

ONE of the lessons which has been learned from the experiences in treating the injuries of this war is the importance, in conjunction with this, of the preservation of function. The amount that can be done has been demonstrated and also the need of the very early application of the principles of the treatment necessary to accomplish this end. The principles of this treatment for the preservation of function are not new, nor are they but recently recognized, having been in use for many years, although with rather a limited application; but a wide application of these principles, which has been necessary in the peculiar kind of injuries received in this warfare, has made their recognition imperative. More has been accomplished in the last few years by the wide application of this method than in several previous decades, and it furnishes opportunity for establishing on a permanent basis the importance of this phase of treatment for the class of injuries which may develop deformities, stiffness and atrophies, either primarily or in the course of slow recovery.

The class of cases referred to are the disabilities following many injuries to joints; the fractures, which involve the surrounding muscles, tendons, etc., either in the original injury or by the protracted process of healing, and result in adhesions, contractions and deformities which are consequent upon the unnecessary and long fixation. Frequently, the results of unnecessary fixation are more severe and more permanent than from the injury itself, and necessitate a long convalescence and invalidism, during which interval the initiative disappears and mental inertia develops. The danger of this has been very well recognized for many years in civil practice, particularly dealing with cases of industrial accident surgery, in which men, taken suddenly from work, have, by the long convalescence, lost their industrial grip. The danger of the development of this mental inertia in the case of the injured soldier,—taken from his life of extreme activity and excitement, removed, as he has been, by a distinct period of time from his industrial life,—is still greater than among those removed from the ordinary conditions of civil life, when the incentives to return to industrial life are greater, because the association is less remote.

A very important feature, then, in addition to the prevention of

suffering to the patients, is this preservation of human energy by an avoidance of long periods of protracted convalescence, which energy would be lost except for this early prevention. This fact alone, brings this feature of the treatment of the soldier into prominence, as one of the most important, and places it in the front rank of general preventive medicine. During this period, the joints are given early mobilization, the fractures are given early motion, massage, etc., preventing the exudate (entirely free from a pathological character) from organizing into the strong adhesions which occasion and often make permanent the resulting deformities. By the application of this same care, and at the same time the attention to the preservation of the normal positions and relations, the preventable deformities which would require a separate treatment, often operative, to a large measure are avoided, and those which do occur are much lessened in severity.

By the early attention to this principle of treatment, the resulting disabilities, seen as deformities, contractions and adhesions, and the resulting atrophies, are reduced to a minimum, and the residue is slight in comparison. It must be recognized, however, that there will always be a residue, which will require treatment, often for long periods of time.

During the period when this treatment has been used in this war, opportunity has been given to emphasize another application of the mechanical principles of treatment, which is distinctly important in its bearing upon the industrial problem.

The employment of mechanical principles in the treatment of the reduction of deformities with their accompanying condition of contraction, adhesions and atrophies, has been in popular use for many years, and its efficiency has been proved by these many years of use. In the early periods, many special mechanical appliances adapted for specific movements have been developed, the most elaborate of which are seen in a series of Zander machines, which have had extensive use, both in their original and costly form, and also in modified and less expensive types. Undoubtedly, under many civil conditions, these will always be necessary, but under the present conditions of this war, and with disabilities which have developed from injuries in combat, a new principle in this mechanical treatment should now be emphasized. This is of added importance, since the same principles can be applied to the conditions of civil accident surgery which will arise in industrial life. The use of purely mechanical appliances is limited to the accomplishment of the local therapeutic result on each

patient; and it also carries with it the danger of too great introspection on the part of the patient toward his own particular malady. Many times, under civil conditions, the use of purely mechanical appliances will be necessary, but it is distinctly to be avoided under the conditions in which we are now working as a result of the war.

As far as is possible, it is essential to stimulate the initiative in the patient by insisting that all effort, at least after the stage in which convalescence is well under way, should be industrially productive in its results, in addition to, and independently of, the local therapeutic object. We now have this exceptional opportunity under war conditions to substitute for this unproductive mechanical therapeutic means a mechanical method of producing the same therapeutic result, but combined with an actual industrial product. Therefore, the mechanical-therapy has now the opportunity of assuming a two-fold importance: (1) That of giving the local physical benefit for which it is definitely applied, and (2) by the use of general vocational measures of combating the inertia which comes during a convalescence associated with pain; and of stimulating the individual toward developing an instinct for industry. This is not difficult, but it is essential to have special equipment, trained instructors and a definite plan of operation. To provide the equipment for this, it is necessary only to adapt the ordinary and simple occupations which are available in any simple workshop by a modification or by an adjustment of the ordinary tools or machinery so that they may be used by the men presenting deformities and disabilities, and thus obtain the same therapeutic result as when the mechanical devices are used.

To illustrate this, a contracted hand in which it is desired to increase flexibility in flexion, as well as to develop the weakened muscles controlling these motions, may be given the ordinary tools in a carpenter shop, provided these are supplied with such adjustments as to enable it to use these simple tools with its disability. The ordinary tools or the ordinary machinery are quite inadequate, even impossible, for use, since each individual will present some form of disability which will prevent his use of the ordinary tool. His very abnormality excludes his use of ordinary tools. If, on the other hand, these are provided with special handles so that the contracted hand can have a firm grasp, and they be of such shape and size that the attempt to firmly hold the appliance results in an increase of flexion, then not only can the individual use this tool as an exercise toward increasing the motion and flexibility of the part affected, but his work can also be yielding some distinct industrial

product. Also, to illustrate, a patient with contracted knee, in which it is desired to increase the motion either in flexion or extension, or both, can be given, under the old methods of treatment, one of the stationary bicycles on which he can use the motion of the wheel as an exercise for this particular object. On the other hand, with the industrial end in view, the same individual may be given some form of machine requiring a treadle motion for power, and this treadle so fitted with adjustments that the requisite amount of motion can be used and regulated. Then the exercise may be used to produce a distinct industrial result, and the individual has the satisfaction of not only working for the benefit of his own disability, but of producing something which has a distinct economic value.

The equipment of such remedial and industrial shops should not be elaborate, for the reason that only the simple, easily applied, or easily learned occupations are of value, since they will invariably be only temporary and the industrial result but a by-product, yet one of a very distinct value. The standard of excellence of this product must be maintained in spite of the fact that it is a secondary object in the treatment.

Before the war, this method had not been developed, since it had been employed, with as definite and thoroughly worked out plan for universal use, only by comparatively few, and mainly by those surgeons who were especially occupied in the so-called industrial surgery. The necessity is clearly seen of preserving the man's industrial instincts and his physical restoration at the same time, or, in other words, the man's industrial instincts must not be atrophied by the treatment or his physical restoration. During this war, this vocational principle has had a wide recognition in many forms; mainly in its application to those disabled soldiers for whom it was necessary to provide some new form of occupation. The stimulus was given early in the convalescent period by introducing some form of vocation as an occupational therapy, to combat the inertia which invariably develops in a prolonged convalescence.

In many of the hospitals in England, one may see this principle carried out in some of its details. The men there, even during the period of their hospital convalescence, work in the shops which are connected with the medical institutions and derive their physical benefit, while, at the same time, they begin some industrial pursuit which later may be of value to them. The emergencies of the war have not allowed the development of this vocational principle of treatment in its more elaborate or important details, but the practical abil-

ity of its application has been very definitely approved by the several years of its trial. The shops are all fitted for various kinds of simple occupations, each one of which demands the particular use of either contracted or weakened members or stiffened joints. The very effort to produce some distinct mechanical product stimulates the individual to increased effort, and at the same time enables him to gain strength and flexibility in the disabled member.

The effect of a distinct occupation on these men, who are necessarily detained in medical institutions for protracted periods, sometimes for many months, is seen in the eagerness and in the quickness with which they take up their occupation after their discharge, and there are many testimonials which have been given voluntarily by the men after their return to civil life which demonstrate their recognition of the value of the time spent in this work.

The same evidence of this value is found in many of the schools in France, in which the men are received after they have been discharged from the army, and to which they were allowed to go for the distinct purpose of learning some gainful occupation. The work in such schools emphasized a somewhat different phase of this principle, in that the therapeutic object is secondary, since these men primarily go to these schools with the object of learning a trade which is possible with their disability. Here very considerable attention is paid to adapt the man's tools and the machinery to his disability. But the effort which is necessary to carry on this occupation results in the gradual improvement of the distorted members and the gradual increase in strength in the atrophied or the partly paralyzed limb. The value of this work is also seen in the general attitude of these men while at work. The depressing effect of their disability, whether it be that of the loss of a limb or the distortion or paralysis of a member, does not seem to act as a deterrent on the ambition or on the persistency of these individuals. The assurance of occupation when their course of training is terminated brings an eagerness to learn and gives an air of hopefulness to these institutions which is always most encouraging

The work which is found in the different centers in those countries which have attempted this work during their period of war demonstrates its value even under difficult circumstances, but it indicates its intrinsic value under all conditions under which it may be thus applied. If this principle of occupational therapy, then, may be adapted to this combined purpose, under the ideal conditions, the results may be expected to be correspondingly satisfactory. Such an

ideal arrangement should eliminate the purely unproductive mechanico-therapy appliances from the treatment of these disabilities resulting from injuries received under the condition when the problem of the industrial life of the individual is important. These disabilities should include the injuries both of war and of industrial accidents, two conditions which, having so much in common because of their industrial therapeutic features, should always be considered together. This elimination of the unproductive mechanico-therapy should apply at least to that part of the up and down period of the man's convalescence when he is able to be out of the ward for a distinct portion of each day, and this practically includes all of these periods of his convalescence when mechanico-therapy should naturally be used.

It becomes our duty, therefore, with our comparatively slight crippling effects of the war, and with the endless resources on which we have to draw, to establish this ideal method of treatment for these men as early in their convalescence as it is medically or surgically possible, and all that may be developed during this emergency can be handed as a legacy for the industrially crippled after the war. Naturally, to have this carried out in an ideal manner, it will be necessary to have a distinct amount of special appliances and tools and adjustments so that all kinds of disabilities can thus be treated with a minimum amount of time and effort. It is very questionable whether it is wise to begin in the earliest stages of convalescence with any of the so-called occupational therapies with any distinct ulterior motive toward individual occupation, at least to the knowledge of the patient, although a director of such occupation may have it in his own plan.

The injuries of this war group themselves into more or less distinct types of deformities and disabilities, so that the routine appliances or adjustments which are necessary in any of the so-called occupational shops are not necessarily large and never need to be elaborate or complicated. In the main, these disabilities for which the routine appliances must be provided may be grouped into those of the six main mobile regions—hand, elbow, shoulder, ankle, knee, and hip. These groups present so large a percentage of the deformities and disabilities that it is possible to have stock sets of appliances for their treatment. The other less common and more complicated disabilities must have the special adjustments devised for their individual needs. The very large number of simple occupations which have been demonstrated as practical allow a sufficiently wide scope for the employment of this principle.

Editorial

THE JOURNAL OF ORTHOPÆDIC SURGERY.

With the present issue, this Journal, which has heretofore been called the American Journal of Orthopedic Surgery, assumes its new name of the Journal of Orthopædic Surgery. That it cannot at the same time assume its additional function of representing the British Orthopædic Association through some contribution from the members of that body is a matter of deep regret. Unfortunately, and for some reason not as yet ascertained, the papers which had confidently been expected for this number of the Journal had not arrived in America at the time the Journal went to press, so that the January number, the first in which the Journal becomes the official organ of both the American Orthopedic Association and the British Orthopædic Association, cannot claim the international character which its Editorial Committee had planned.

With the elimination of the national adjective from its title, the Journal hopes to be not less American, not more British, but to invite to its columns, as always, the best of both nations.

At the present time it is the only journal in the English language dealing exclusively with orthopædic surgery. By this we mean not merely the past conception of the term in its literal sense of "straightening out the child," nor even the later pre-war connotation which it was coming to have in the minds of its broadest exponents, but we have added to this all that the orthopædic surgeon has been called upon to do by the exigencies of war and reconstruction for the straightening out of the grown man. This, as Lieut.-Col. Osgood points out, would also include some phases of industrial surgery.

Last month, in this Journal, Major Ridlon told of the difficulties in founding a journal devoted to the specialty of orthopædic surgery. It was, in the beginning, a very narrow field and the outlook precarious, but the Journal has gone on, and the specialty has gone on, until we see its culmination in the magnificent work done for our soldiers under the guidance of Sir Robert Jones.

It is this broadest and most idealistic conception of orthopædic surgery which the present Journal hopes to be the instrument for carrying on.

Correspondence

November 18, 1918.

To the Editor, American Journal Orthopedic Surgery,
Boston, Mass.

Traction, Stretching, Suspension as a Remedial Measure. Why is this so little used by medical men? Request for information by J. Madison Taylor, M.D., 1504 Pine St., Philadelphia, Pa., Prof. Applied Therapeutics, Med. Dept., Temple University.

Traction in one form or other has been employed with confidence by surgeons in the more obvious conditions involving contraction. It has been applied by physicians in a number of conditions where it seemed promising, and then abandoned. The question arises: Was it applied to suitable conditions and in judicious fashion?

In reconstruction work among war cripples traction has proven of decided advantage, especially when combined with muscle training. I am of the opinion traction could be made more efficacious where the element of muscle spasm was given more careful attention and preliminary relief afforded by manipulative moulding, mobilizing and by meeting other indications.

Traction oftentimes affords relief to discomforts even where the morphologic changes appear so slight as to be negligible.

For several years suspension was employed with much hopefulness in certain diseases of the spinal cord. At the Phila. Orthopedic Hospital and Infirmary for Nervous Diseases (where I was Chief of Clinic for Dr. Weir Mitchell) we used suspension for years. Why it was abandoned I never could learn. Some cases markedly improved; our technique was perhaps faulty. The process involved some labor and skill. The work devolved on me chiefly, and it certainly occupied much time and strength. The assistants shirked the job, and lay attendants were too few and incapable. None of these were good reasons, however, for abandoning it.

In the literature there are occasional references to traction, and by some it is highly extolled.

I should be grateful for information on the subject, and the opinion of those who have had experience or have formed definite conclusions.

Book Review

The Human Skeleton. (An Interpretation.) HERBERT EUGENE WALTER, Associate Professor of Biology, Brown University. The Macmillan Co., New York City, 1918.

Those orthopædic surgeons who have time to pause from their routine work will be amused and instructed by a careful perusal of this work.

At first glance of the title, the average orthopædic surgeon would dismiss the book with the thought that there was very little new for him to learn regarding the human skeleton. Professor Walter, however, has brought into association and juxtaposition a large number of anatomic facts, both morphological and comparative, and has made up of this ordinarily uninviting material a book which is really absorbing in its interest.

A great deal of the information contained is, of course, elementary. Even this it will not harm the average orthopædic surgeon to read once again. The book is full of philosophical observations which enliven the pages and contains a few puns which rather detract from the otherwise high standard of literary excellence maintained.

The following introduction to the chapter entitled "The Adaptation of the Human Foot," indicates the general tenor of the work. "Human feet have never quite recovered from their surprise at finding the body tipped up on an end and in having thrust upon them the entire responsibility of its support. They have done the best they could in the evolutionary time they have had with the inherited materials that were on hand, but it must nevertheless be confessed that the result is as yet only a makeshift foot. The various foot troubles of man are an eloquent confirmation of this statement."

Many similar doses of "food for thought" for the orthopædic surgeon are contained in these two hundred and fourteen pages. The book is evidently written primarily for the laity. The profession will also do well to read it.

SINCE we are reasonably assured of peace and the entrance of American armies into the conflict has made us participate more than has been our custom in international affairs, it does not seem amiss that in other affairs than military ones we should expand as internationalists. The American Orthopedic Association, therefore, welcomes the entrance upon a phase of this sort of scientific coöperation with our British ally with much satisfaction and looks forward to an expansion of our mutual scientific interests as well as to other sorts of satisfaction in the new relations. The American Editors regret that this, the first number of the journal which marks the publication of the JOURNAL OF ORTHOPÆDIC SURGERY, should not contain articles from our British confreres, but delay in the arrival of the manuscripts has prevented their appearance before the February edition.

Current Orthopaedic Literature

Numerals at head of each abstract are for use in connection with the official "Classification of Orthopædic Literature," published in the JOURNAL for January, 1917, reprints of which are obtainable from the JOURNAL office.

I. ORTHOPÆDIC SURGERY.

I and III, 7.

THE CASUALTIES OF WAR AND INDUSTRY AND THEIR RELATION TO ORTHOPÆDIC SURGERY. A. H. Freiberg. *Journal A. M. A.*, August 10, 1918, p. 417.

This address expresses beautifully the fact that the orthopædic surgeon is being called on more and more in war work because of his superior mechanical skill together with the mastery of operative surgery.

He designs his apparatus not so much with regard to beauty as to simplicity and to the principles of surgical pathology.

Sir Robert Jones says: "The orthopædic mind thinks in terms of function."

Dr. Freiberg believes that one is an orthopædic surgeon "not in order to fit the task to an aptitude which is restricted, but rather to apply a larger vision to the solution of difficulties in a sphere which is narrowed for the sake of greater efficiency, and not for any other reason."

The work of caring for cripples in war and peace is the same, and the lesson learned in war should be utilized in time of peace.—*E. S. Hatch, New Orleans.*

III. ORTHOPÆDIC OPERATIVE, POST OPERATIVE AND ADJUVANT TECHNIC.

III, 3.

PART PLAYED BY BONE GRAFT. M. Mamourian. *British Medical Journal*, July 27, 1918.

The author believes that bone-graft surgery is not practised as widely as it should be. He summarizes the views of the pioneers in bone-graft surgery. He believes the best results are obtained when all the elements which enter into the constitution of bone are used in the graft. He says that the graft supplies the biochemical stimulus or irritant which has been abolished by trauma or disease. The new bone is formed from the diaphyseal ends, from periosteal and bony remains in the shaft and in the young by epiphyseal lengthening. Histories of four cases and diagrams accompany the article.—*Edward Z. Holt, Atlantic City.*

III, 7 and 12.

THE TRANSPORT SPLINTS OF THE AMERICAN ARMY. R. B. Osgood. *Journal A. M. A.*, August 31, 1918, p. 734.

These splints are the seven types that were advised by the Splint Board appointed by the Chief Surgeon, American Expeditionary Force, and which were later described in a manual published and distributed to the American Overseas Force. They are:

I-A. Thomas traction leg splint.
I-B. Blake-Keller hinged leg half ring and modification of Thomas traction leg splint.
II-A. Thomas traction arm splint.
B. Murray's modification of the Thomas arm splint.
III. Jones' humerus traction splint.
IV. Long Liston splint with bridge interruption.
V. Cabot posterior wire splint.
VI. Jones' "cock up" or "crab" wrist splint.
VII. Ladder splint.

Illustrations of all these splints are shown, and the various injuries for which each splint is best adapted are given.—*E. H. Hatch, New Orleans.*

III, 7 and 12, and XIX, 2.

RELATIVE VALUES OF THE PRINCIPLES OF EXTENSION, SUSPENSION AND MOBILITY EXEMPLIFIED IN BOTH CIVIL AND WAR PRACTICE BY THE HODGEN WIRE CRADLE EXTENSION SUSPENSION SPLINT. Frank G. Nifong. *Journal A. M. A.*, September 21, 1918, p. 956.

The author feels that in the treatment of fractures of long bones,—for example, the femur,—that fixation and extension, which implies counter extension, are best utilized by the Hodgen splint. Abduction and adduction can be secured and wounds in the soft parts can be completely washed and dressed. *E. S. Hatch, New Orleans.*

III, 2.

RECENT STUDIES IN THE ANATOMY AND PHYSIOLOGY OF TENDONS. THEIR APPLICATION TO THE TECHNIC OF TENDON OPERATIONS. Leo Mayer, M.D., *Journal A.M.A.*, October 12, 1918, p. 1198.

From experiments upon the animals and the cadaver Dr. Mayer points out that tendons are separated from the surrounding tissues where sheaths do not exist by a highly elastic tissue which he calls the paratenon. Various substances were employed to render tendons freely mobile in the surrounding tissues, but without success.

To preserve the mobility in the tendon transplantations of paralytics, he advocates following Biesalski's method, which utilizes the sheath of the paralyzed muscle as a physiological pathway for the transplanted tendon

Dr. Mayer warns against overstretching of the tendon.—*Harold A. Pingree, M.D., Portland, Maine.*

III, 3, *a*.

SPINAL BONE GRAFTING. T E. Lambert. *The Medical Journal of Australia* June 29, 1918, V. I, No. 26.

Finding that the Hibbs operation for immobilizing spinal caries by splitting the spinous processes and uniting these fragments alternately to those above and below gives a weak splint and that the Albee operation of inserting a tibial graft into the split processes does not always take, author proposes to raise the spinous processes entire from their laminae for as many vertebrae as needed, insert the tibial graft, replace all tissues and suture in place.

He frees and retracts muscles from one side as if for a laminectomy, chisels the spine free, but does not cut interspinous ligaments. Patient is kept on side till tenderness is gone and usual nursing and medical treatment of tuberculosis is enforced.

While more severe than the operations it is planned to replace, it deserves further trial. He cites ten successful cases.—*L. P. Hoole (1st Lieut., M. C., U. S. A.), Camp Greenleaf, Chickamauga Park, Ga.*

III, 3, 4, and 7.

BONE GRAFT AND ARTHRODESIS IN RECONSTRUCTION SURGERY. F. G. Dubose . *Sur., Gynec. and Obstet.*, Sept., 1918.

There is a tediousness, or time-taking element, in reconstructive surgery greater than in ordinary operations. There is a pain habit existing as truly as the status epilepticus, and painful distortions endured over many years require a long interval of time after operative relief before the pain impulse is obliterated, which is as discouraging to the patient as it is irritating to the surgeon.

Preliminary preparation of the patient in building up resistance with vaccines, protecting with sera, elimination of intestinal toxines, alkalinizing the system, loading it with carbohydrates in the form of glucose and filling the tissues with fluid before and during prolonged operations by hypodermoclysis are of value.

Technically, the joint, bone and tendon operations are not more difficult but the successful outcome is more dependent on absolute asepis, and the chances are relatively far greater for failure following a careless or indifferent aseptic technique in this class of surgery than in any other. Infection not only spells failure, but frequently is life taking. It almost certainly deprives the patient of future opportunity for a second successful trial.

Antiseptic treatment is a preoperative measure, while aseptic technique is paramount and must be actuated by mental alertness with a regard for strict cleanliness approaching fanaticism. Wherever and whenever time permits, teeth, tonsils, accessory sinuses, and all possible sources of infection are removed prior to infection; otherwise they are attended to at the same time the other surgery is done.

Reconstruction operations are the consummation of conservative surgery. All is saved that can be used, and all is used that can be saved. Brief reports of eight cases are appended, in which the author presents very satisfactory results. The article is well illustrated.—*Leo C. Donnelly, Detroit*

III, 7.

SPLINTS FOR TRANSPORTATON. Major Kendall Emerson. *Boston Medical and Surgical Journal,* Sept. 12, 1918.

Describes various splints which will provide proper and early fixation of fractures for transportation from firing line to base hospitals. The value of splints for this purpose, he says, must be judged by: 1, Efficiency; 2, simplicity; 3, adaptability; (*a*) easy access to wounds; (*b*) facilities in transportation.

A number of splints in common use by military surgeons, which conform to the above requirements he takes up by groups as adapted to various regions of the body.

1. Hand and Forearm. Straight or coäptation splints of sheet iron or wood are easily padded and made to conform to the arm.

2. Elbow, Arm and Shoulder Joint. *a,* Thomas arm splints giving fixation and traction. Clove-hitch about the wrist with a gauze bandage gives rapidity of application. *b,* Jones humerus traction splint used for wounds above the elbow.

1. Tarsus and Forefoot. Jones rectangular foot splint used in conjunction with Jones leg splint.

2. Foot, Ankle and Lower Leg. *a,* Posterior leg splint with coäptation splints: 1. Wooden posterior splint; 2. Cabot posterior wire splint. Should be used only with side splints, care being taken to have alignment of toes and patella and right angle position of the foot. *b,* Jones combined ankle and lower leg splint may be applied outside the clothes, bending the single posterior wire and the sheet-iron bands to fit the thigh and calf.

3. Knee and Thigh. Thomas traction leg splint is the most useful splint for wounds of the lower limb and hip-joint where injury to the soft parts is such that a bearing surface for the ring is intact. He explains application of the splint in detail.

4. Hip and Pelvis. *a,* Long Liston splint, modification of the "bed-slat." An offset of wood on angle-irons allows for dressing of wounds and avoids prominence of hip and buttocks. The adjustable foot-piece allows the splint to be used on either leg. *b,* Straight "bed-slat" splint, board 4 or 5 inches wide extending from the axilla to below the sole of the foot. It should be liberally padded.

5. Spine, Cervical, Dorsal, Lumbar. Bradford frame or stretcher prepared to conform with the curves of the body.—*Capt. Dean S. Luce, M.C.*

III, 7.

MEDICAL WORK WITH THE AMERICAN EXPEDITIONARY FORCES. Lieut.-Col. Robert B. Osgood, M.C. *The Military Surgeon,* Oct., 1918.

The different professional divisions of the American Medical Expeditionary Forces are in close contact with one another and work in close harmony.

During the precombat period the division of psychiatry weeded out the mentally unfit. Also the genito-urinary problem immediately needed attention. Men are actively treated for syphilis for six months and then the routine anti-syphilitic treatment kept up until apparently cured. The orthopædic division found much work to be done in combating foot strain, faulty posture, back strain and inability to stand regular military training. Military training under line officers with the supervision of orthopedic medical officers in the three months time returns 80% of these men to general

military service and returns 90% for military service. This activity extends to the entire Expeditionary Force.

MEDICAL WORK IN THE COMBAT DIVISION.

The most acute attention is focused on getting the casualties back to the Evacuation Hospitals in the best possible condition and the least possible time. Genito-urinary, psychiatric and orthopedic divisions are maintained with the combat troops.

Seven splints were accepted as standards and a manual printed showing their uses. 25,000 copies of this manual were distributed to American medical men before there were any American casualties. The record time for applying a Thomas splint with all the accessories is 2 minutes and the stretcher bearers are all supposed to better 6 minutes. The fracture cases are coming back in excellent shape and the splinting is excellent.

The division of roentgenology is working out a scheme for transmitting of x-ray plates with the injured man.

The special cases of bone and joint injury are segregated as much as possible and sent to special bone and joint hospitals. These are in the advanced, intedmediate and base zones. Amputations are sent to special hospitals and early treatment for weight bearing is begun. Early applications of artificial limbs is accomplished. The responsibility for the end results of bone and joint cases has been placed with the division of orthopædic surgery.

Curative workshops are being established in orthopædic centers and the bedside reconstruction aides with their stimulating personality are winning the disabled soldiers to vocational and important occupational work. Convalescent camps under military and medical supervision are fitting the convalescent soldiers for early return to full duty.—*Leo C. Donnelly, Detroit.*

III, 7, and XIX, 2.

SOME POINTS IN THE TREATMENT OF BONE AND JOINT WOUNDS. Lennox G. Teece. *Medical Joural of Australia.* August 3, 1918.

The compound fractures of the femur were treated almost exclusively on the Thomas bed knee splint except that for those in the upper third of the thigh a Jones' abduction frame was used. This frame holds the lower fragment well abducted and thus brings it into line with the upper fragment, which is held in that position by the action of the powerful group of abductor muscles. The abduction frame secures abduction of the lower fragment, which the Thomas splint cannot do.

The deformity most difficult to overcome is posterior displacement of the lower fragment, which is present in nearly all cases. This displacement is due partly to gravity and partly to the pull of the gastrocnemius muscle. There is only one way in which this can be overcome. The posterior support must consist of strips of flannel 10 cm. wide placed in close apposition to one another under the limb, then threaded around inner bar so they can be brought under limb double. It is essential that the strip which passes under the site of fracture be adjusted first. It should be examined and tightened daily, if necessary, to overcome the posterior bowing.

If the fracture is at the junction of middle and lower thirds of the femur, the Thomas splint should be bent so that the knee is flexed to 35°, thus relaxing the pull of the gastrocnemius. The extension is made by two extension strips tied to the bottom of the splint being tightened daily, thus gradually overcoming the shortening.

If backward bowing occurs, a condition of genu recurvatum is produced, and walking is extremely difficult. To prevent shortening of the tendo achillis, the foot is maintained at right angles to the leg by means of strips of gauze glued to the dorsum and the sole of the foot, and tied to the top horizontal bar of a foot piece.

As regards wounds of the knee joint the early treatment in France followed four main lines:

(1) Excision of wounds, irrigation of the joint, complete closure of the wound after joint is filled with two per cent. solution of formalin in glycerine, or perhaps insertion of a small drain into the subcutaneous tissues.

(2) Primary excision of joint even in presence of sepsis.

(3) Wide laying open of the joint by turning the ligamentum patellae and patella upward and flexing the knee acutely, afterward straightening the limb and replacing patella when sepsis has subsided.

(4) Drainage of the joint by means of tubes passed through from side to side.

Primary excision of the joint should unhesitatingly be condemned.

Primary excision and closing of the wound gave excellent results in some cases. Wide opening of the joint with through and through drainage often resulted in ankylosis, bony or fibrous, but usually successfully combated the sepsis.

The prognosis as to movements depends mainly on whether or not there was a fracture through any part of the articular surface. In its absence the results were very good. In its presence the outlook as to movement was poor. Ununited fracture was confined almost entirely to humerus, radius, and ulna. The persistent non-unions were treated by bone graft.—*Llewellyn H. Rockwell, 1st Lieut., M.C., U.S.A.*

III, 7, and XIX, 2.

SUSPENSION AND TREATMENT BY TRACTION, OF FRACTURES IN BASE HOSPITAL WORK. G. A. Moore. *Boston Medical and Surgical Journal,* Sept. 12, 1918.

As a result of modern warfare methods, the treatment of fractures demands new methods. There are now new conditions, such as: 1, Great lacerations of soft parts and comminution of bone; 2, frequent injury to nerves: 3, extreme virulence of infection of the majority of wounds, which necessitate prolonged treatment, wet dressings, and immobilization.

The principles which should govern treatment of such injuries require: 1, Easy access to wounded limb; 2, patient should be able to move about in bed; 3, circulation maintained and edema avoided; 4, mobility of joints maintained, to prevent ankylosis; 5, apparatus adaptable to any fracture with sufficient traction.

The earliest mention of a suspension method is by Dr. Smith, in 1826, which is for base hospital work, and is the overhead Balkan frame. The Balkan frame is composed of a head piece and foot piece, two or three overhead bars to extend between head and foot piece. Narrow boards three inches wide, one inch thick are used. The head and foot pieces are strapped to the head and foot of the bed. Traction is maintained by boards glued to sides of leg and drawn tightly over bar at foot of splint.

The jointed Hodgen splint and the Balkan are both excellent.

In treatment of femur fractures at any level, flexion of hip and knee should be maintained whenever possible. Use bands of heavy cloth six to 10 inches wide for suspension. Verify with x-ray. In suspending leg fractures, pull at an oblique angle toward foot. Raise foot of bed six to ten inches.

For traction there are four methods: 1, Adhesive bands, or flannelette glued to skin; 2, Hennequin's band; 3, some form of laced gaiter; 4, direct traction by Steinman pin. Support toe to prevent toe drop.

SPECIAL FRACTURES.

First. Femur, upper third fragment, held abducted, flexed and rotated outward, lower third fragment brought into alignment with upper. To do this, flex knee or raise leg and suspend in this position with abduction. Traction made above knee, and jointed. Hodgen splint applied to prevent ankylosis of knee.

Second. Femur middle third, like upper, use slightly bent splint.

Third. Lower third, difficult to treat, due to backward pull of distal fragment, by gastrocnemius. Use Hennequin band or Steinman pin. Thomas knee splint may be used in other cases.

Fourth. Lower leg, fibula alone, not much attention. Tibia alone, suspension and traction, pull more on inner side. Both bones, traction in axis of shaft of tibia. Use lateral glued bands and avoid pressure on malleoli.

Fifth. Tarsals and metatarsals, use suspension only, no traction.

Sixth. Humerus. Use aeroplane splint, of Leyva, for suspension traction. Infected, use Balkan frame, but no splint. Use band, the width of which corresponds to length of upper arm.

Seventh. Forearm. Suspend vertically, with elbow at right angles. Bands are glued to flexor and extensor surface of the arm.

Eight. Fractures involving elbow joint are treated by Flint with splint similar to that used by Smith for leg splint.

Conclusions. Suspension and traction in the treatment of fractures was introduced because of the bad compound fractures. It is of inestimable value. Patient has more comfort, mobility of joints permitted, easy access for dressing, edema prevented, circulation better, wound heals quickly.—*N. J. Seybold, 1st. Lieut. M.C., U. S. Army.*

III, 7, *b*.

PROBLEMS OF RECONSTRUCTION OF HAND. A. Steindler. *Surg., Gynec. and Obstet*, Sept., 1918.

Reconstruction surgery of the hand involves the following problems: (1) The work of the muscle and tendon reconstruction; (2) reconstruction of the peripheral nerves and reëstablishment of the neuromuscular relations; (3) bone plasty, arthroplasty and autoplasty. The paper deals with the first problem. The complicated functions of the hand are subordinated to rigid mechanical and mathematical laws. The principal factors of muscle mechanics are: The volume of the muscle, the tension, the distance of contraction, and the angle of the application of force. Five charts are appended which show rotation and stabilizing components, sine and cosine curve of muscle action, numerical contraction power in flexion and exten-

sion of wrist and the relative amount of muscle power in either optimum of tension or minimum of tension. Sources of error creep in which make the readings of comparative value. The mechanism of the wrist joint is well worked out. mechanically and geometrically.

Case reports of seven cases of Volkmann's contraction which were operated. The difficulties encountered attest the formidability of the procedure.

It is a scientific paper and impresses one how immensely complicated are the mechanics of the movements of the wrist and hand. It is well illustrated and has a complete bibliography.—*Leo C. Donnelly, Detroit.*

III 7, *c*, and XVIII, 1.

THE ARMY SHOE AND MILD FOOT DISABILITIES. J. Torrance Rugh, M.D., Lieut. Col., M.C., U. S. Army. *Journal A.M.A.*, Oct. 12, 1918, p. 1215

Colonel Rugh gives a brief and very practical statement of the effect of the regular United States Army shoe upon the foot of the soldier. He lays great stress upon having the shoe long enough, one-half to three-quarters of an inch longer than the foot.

He calls to mind a fact which we all should remember, that a shoe may stretch laterally but never longitudinally.

He mentions the marked improvement of the soldier's foot in power, flexibility and general function, all due to proper shoeing. Not only his extensive experience in the army, but also his long years of practice as a civil orthopædic surgeon before the war, lend great weight to Colonel Rugh's article.—*Harold A. Pingree, M.D., Portland, Me.*

III 7, *c*, and XVIII, 1.

THE FOOT PROBLEM. 1st. Lieut. Tom S. Mebane, M.C. *Military Surgeon*, Oct., 1918.

Based on the experiences of the Camp Orthopædic Service at Camp Beauregard.

The camp orthopædic surgeon is charged with the prevention of foot trouble, the elimination of the unfit, and the rehabilitation of men with remediable foot conditions. The first is accomplished by educational means, the second, by examinations; and the third, by the establishment of the orthopædic camp.

Methods designed to prevent foot trouble are as logical and as fruitful as methods designed to prevent infectious disease. The only excuse for foot trouble in a soldier previously fit is foot trauma. Measures taken to prevent foot trouble and the exercises to strengthen the foot muscles were included in the training schedule for the division. The orthopædist should see that the men have correctly fitted shoes.

None of the following classes of foot defects are fit for active overseas service: (1) Flaccid feet with marked abduction or eversion; (2) rigid or spastic flat feet; (3) rigid arthritic or post traumatic flat feet; (4) marked cavus; (5) pes varus or valgus following fracture; (6) extreme hallux valgus associated with painful bunion or metatarsalgia; (7) hallux rigidus; (8) amputation, or partial amputation or severe derangement of joints of the great toe; (9) proved exostoses of the undersurface of the os calcis.

The following type of cases can be accepted with the assurance that they can be made fit within a short time, in the great majority of cases: (1) Flaccid feet without much abduction or eversion; (2) ankle valgus, not the result of fracture; (3) poorly developed but not pathological feet. The third great class of cases, such as hallux valgus, uninflamed bunion, claw toes, hammer toes, ingrown nails, corns or callosities, etc., can be accepted with rare exceptions. These cases, if given properly fitted shoes and such minor chiropody as may be indicated, will develop no further trouble.

Forty per cent. of negroes examined had flat feet.

For overseas work a division orthopædic surgeon, company non-commissioned foot officers, regimental chiropodists and cobblers are trained.

A three weeks' course of instruction has been given to non-commissioned foot officers and regimental chiropodists.—*Leo C. Donnelly, Detroit.*

V. TUBERCULOSIS.

V, 2, *a*.

TREATMENT OF VERTEBRAL TUBERCULOSIS BY FUSION OPERATION. REPORT OF TWO HUNDRED AND TEN CASES. Russell A. Hibbs, M.D. *The Journal of the A.M.A.*, Oct. 26, 1918, p. 1372.

Dr. Hibbs, in his paper, has described an operation containing some further extensions and improvements upon his original one. The main points are as follows: There is but one incision in midline, and the periosteum and overlying tissues are pushed aside. At least two vertebrae on each side of the lesion must be included in the operation. The periosteum must be separated from the vertebrae from the tips of the spinous processes to the articulations. The articulations are destroyed with a curette. The laminae are connected by means of long bone chips removed from their substances. The processes are broken at the bases and bent down so that each bare tip touches bare bone on the next below. It is absolutely necessary that all soft tissue be removed and that the contact between bony surfaces be perfect.

Following the bone work the periosteum is sewed over the spine as a whole and forms in this way a sort of roof over the spinous processes. A brace or corset should be worn for six months.

Dr. Hibbs reports a series of two hundred and ten cases running through a period of four years, the last one in 1915.

The cases are very methodically and carefully taken up in regard to general health, local conditions and complications, and the results are conscientiously measured. Seventy-five per cent. have been cured and twenty-five per cent. have attained varying degrees of improvement. Dr. Hibbs acknowledges his failures as well as claims his successes.

As in most surgical procedures where technic is highly developed, descriptions cannot compare with actual observations in the operating room. —*Harold A. Pingree, M.D., Portland, Me.*

IX. CONGENITAL DISLOCATIONS AND LUXATIONS.

IX, 2.

CONGENITAL DISLOCATION OF THE HIP IN THREE GENERATIONS. Samuel A. Jahss. *New York Medical Journal*, September 28, 1918.

This case is reported on account of its rarity, although the condition is known to be occasionally hereditary. A young girl reported for treatment

of a limp, and it was noticed that the mother showed a similar gait. The history revealed that the limp had been noticeable in both mother and daughter since walking was first begun. X-rays revealed typical congenital dislocation of the right hip. The mother stated that her mother had a limp exactly similar to that of her daughter and herself. The grandmother is dead, but her history seems to warrant the diagnosis of congenital dislocation.

XII. CHRONIC INFECTIONS OF JOINTS AND BURSAE (NON-TRAUMATIC).

XII, 1.

ISOLATED DISEASE OF THE SCAPHOID. Charles R. McClure, M.D., *The Journal of the A.M.A.*, Oct. 26, 1918, p. 1360.

Dr. McClure reports a case of isolated disease of the scaphoid bone in a boy of 7 years. Syphilitic and tuberculous tests were negative. General health was excellent. There was no history of serious injury.

The treatment carried out by Dr. McClure was immobilization in plaster-of-Paris and prevention of weight-bearing for five months. At this time use of the foot was allowed and since then no trouble has been reported.

Four excellent skiagrams illustrate the paper.—*Harold A. Pingree, M.D. Portland, Me.*

XII. CHRONIC INFECTIONS OF JOINTS AND BURSAE (NON-TRAUMATIC).

XII, 3.

THE TEETH AND TONSILS AS FACTORS IN ARTHRITIS. Roland Hammond. *American Journal of Medical Sciences,* October, 1918.

The relation of the teeth and tonsils to arthritis is at present a moot question. It is probable that the pendulum has swung too far in the direction of the wholesale removal of teeth and tonsils. There is undoubted improvement in numerous cases of arthritis following the removal of an abscessed tooth or a diseased tonsil or when a case of active pyorrhea has received proper treatment. Many such cases are, on the other hand, given similar careful treatment without affecting the progress of the joint condition in the slightest degree. Success in treatment of foci in the teeth and tonsils lies with the men who can distinguish the apical abscess and the diseased tonsil which are overcoming their infection by nature's methods. They must know by careful and special training when a tooth or a tonsil is an active agent of infection. Such knowledge must be supplemented by accurate interpretation of dental roentgenograms and skilful laboratory work. Often the focus of infection lies not in the teeth or the tonsils, but in some other part of the body, where it may be discovered by careful search. Many of the cases of chronic progressive arthritis are believed by thoughtful physicians to be due to a disturbance of the metabolism, probably chemical in nature, which produces joint changes not always to be distinguished from those caused by bacterial agency. One very suggestive fact brought out by the author's investigation has been the marked improvement

in the general health of the patients when diseased conditions of the teeth and tonsils have been properly treated. It oftentimes seems as if a millstone had been removed from their necks. This is noted very commonly even when no change was apparent in the joint condition.

XII, 11.

CASE OF HEMOPHILIA WITH EFFUSION INTO KNEE JOINTS. P. B. Roth. *British Journal of Children's Diseases,* April-June, 1918.

A case of hemophilia with absence of family history. The father was not a bleeder. From the x-ray diagnosis the author predicted more or less ankylosis. He advised the use of knee cages to prevent further injury, and thymus gland and calcium and magnesium salts internally. Patient's tonsils are large, red and obstructive. The author is "searching" for a surgeon to remove them.—*Edward Z. Holt, Atlantic City.*

XIII. ACUTE AND CHRONIC AFFECTIONS OF MUSCLES, TENDONS AND LIGAMENTS.

XIII, 8, *b*.

PATHOLOGY TREATMENT OF VOLKMANN'S CONTRACTURE. Réné Dumas. *Paris Médical,* January 26, 1918.

Insidious in the beginning, the affection is not always recognized. The typical picture of the contracture, fully developed, is as follows:

The end and middle phalanges are flexed while the metacarpo-phalangeal joint is in hyperextension; the wrist joint is flexed. In the thumb the flexion of the phalanx is not always present.

Not only active extension is impossible but also attempt at forcible correction fails, even under anesthesia. This syndrome presents not merely a complication of the fracture of the elbow but the condition is a distinct pathological entity. The term contraction, as employed by Volkmann is, according to the author, wrong and the deformity should be called a retraction. The muscle substance being involved in a process of fibrosis and having lost its normal extensibility, the author prefers the name of retractile myositis to signify infiltration sclerosis of the muscles. This sclerosis of the muscles is entirely confined to the flexor muscles of the forearm as a result of a circulatory disturbance following the injury or the application of restricting appliances. In the author's opinion, however, this explanation leaves open several questions, especially the point why this circulatory disturbance should result in sclerosis while others do not and why the sclerosis should develop exclusively in the flexor muscles.

The author distinguishes between grave anatomical lesions in which sclerosis is generalized and in the slighter lesions in which only single flexor

muscles are involved. The cause in the first group of cases is compression of the forearm by tight bandages and pressure from hematoma or phlegmon of the forearm. The author does not think the fibrous retraction alone responsible for the deformity, as by this contraction alone hyperextension in the metacarpo-phalangeal joint could not be explained, although he grants that this retraction plays an important rôle in bringing about the claw hand deformity. The determining factor of the claw hand deformity in Volkmann's contracture is the lesion of the median and ulnar nerve, in which opinion the author is substantiated by Hildebrand, Kirmisson and others. The author's definition of the deformity is as follows:

Deep contusion of the masses of the forearm muscles, accompanied by hematoma and compression of the nerve of the forearm.

In regard to the treatment of this deformity the author follows well developed lines, either plastic lengthening of the flexor tendon or shortening the bones of the forearm. He does not mention, however, the neurolysis or any operation of the peripheral nerve itself, at the stage of already developed deformity.

In a number of cases the development of this deformity can be obviated by energetic action. In the first place the cause of the compression, such as tight plaster casts, must be removed without delay, the hematoma incised, fragments removed and the compressed nerve freed. In order to avoid threatening contracture, massage and passive motion should be carried out. Passive motion toward hyperextension of the wrist and toward extension of the finger joint is of greatest importance. The prognosis of the affliction is, in the author's opinion, favorable, as the majority of cases are amenable to complete cure and Volkmann's is one of the most easily cured.

Most other observers, however, show decided reserve in predicting the restoration of the function of hands afflicted with Volkmann's contracture.—*A. Steindler, Iowa City, Iowa.*

XIV. PARALYTIC CONDITIONS.

XIV, 1, *c*.

OPERATION FOR THE CORRECTION AND PREVENTION OF PARALYTIC GENU RECURVATUM. Willis C. Campbell. *Journal A. M. A.*, September 21, 1918, p. 967.

In this operation the tendon above the patella is lengthened, and the lower third of the patella is fixed to the anterior aspect of the tibia below the knee joint. The upper two-thirds of the patella act as a stop joint and prevent hyperextension. One case is reported.—*E. S. Hatch, New Orleans.*

XIV, 2, *c*.

AN OPERATION FOR STABILIZING THE FOOT AND ANKLE IN FOLIOMYELITIS: A FURTHER REPORT. Frank E. Peckham. *Journal A. M. A.*, August 10, 1918, p. 438.

The operation consists in a fascia lata transplant into the fascia of the paralyzed tendons of the foot. A good anchorage is secured, and function greatly improved.—*E. S. Hatch, M.D., New Orleans.*

XIX. TRAUMATIC CONDITIONS.

XIX, 2, *a*.

FRACTURE OF THE SPINAL COLUMN WITH AND WITHOUT CORD INJURY. Norman Sharpe, M.D. *The Journal of the A.M.A.*, Oct. 26, 1918, p. 1362.

Dr. Sharpe says we think of spinal fracture in terms of cord symptoms, and calls to our attention the many cases that are not diagnosed until long after the injury. He thinks that bone injury to the cord seldom takes place when the articulations are unruptured.

He urges the early use of the x-ray and early operation upon those cases possessing disturbance of the cord. He quotes a number of cases in which better results might have been secured by operation soon after the injury. His method of treatment when the cord is not involved is the use of plaster-of-Paris corsets and collars, and five such cases are reported in detail.

The article is illustrated by means of skiagrams.—*Harold A. Pingree, M.D., Portland, Me.*

XIX, 2, *c*.

METHOD OF EXTERNAL FIXATION FOR FRACTURED FEMUR. E. L. Eliason. *Sur. Gynec. and Obstet.*, Oct., 1918.

A dressing in order to be efficient must (1) fix both fragments as well as the joint above and below in whatever position is desired, (2) permit proper bed care of the patient, which means his being turned or moved without danger of strain at fracture site, (3) provide dependable traction which can be maintained and the amount accurately registered at all times. (4) permit of its application with the least possible concurrent danger of displacement of fragments at the time, and lastly allow a safe transfer of the patient.

The author seems to have filled all of these requirements for fracture of the femur. A Hawley table is used, a Bradford frame, and three additions to the Hawley table: (1) An adjustable extension permitting traction in the extremely flexed plane, (2) to counteract this pull an adjustable plate applied over Poupart's ligament and the anterior superior spine, plate attached to perineal upright of the table, (3) stirrup attachments to hold the Bradford frame level when lower end of Hawley table is dropped By means of Steinman nail or Ransohoff or Syms tongs the fracture is reduced, extension being direct on the femur. Cast is applied from umbilicus to sole of injured side and to mid-thigh of uninjured side. Cast is attached to Bradford frame at four places. Patient, cast and frame are *en bloc*, and subsequent displacement is impossible. Article is well illustrated. —*Leo C. Donnelly, New York.*

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